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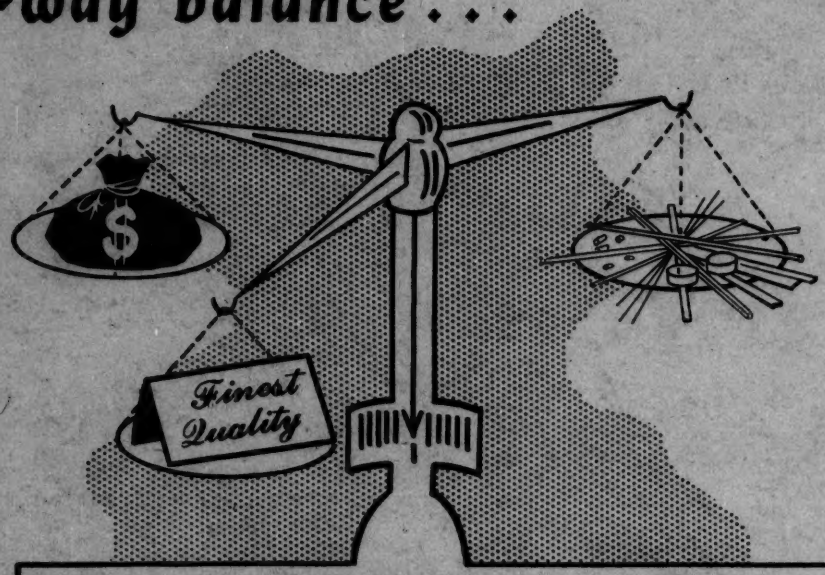

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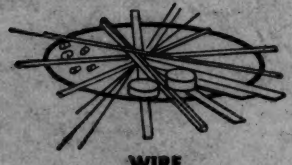

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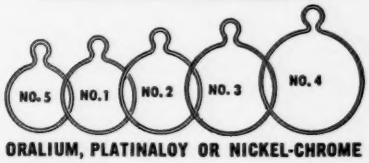

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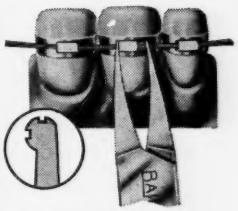

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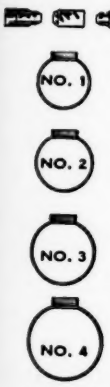

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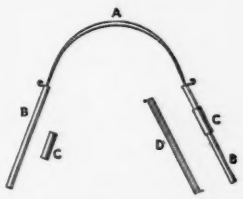

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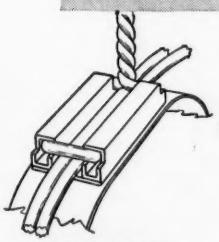

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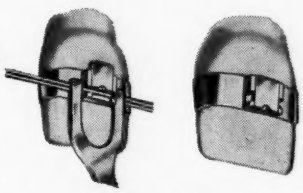

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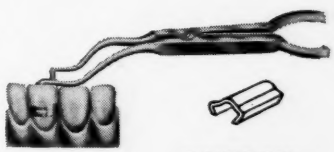

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American Journal

of

ORTHODONTICS

VOL. 46 MAY, 1960 No. 5

Original Articles

PRESIDENT'S ADDRESS, AMERICAN ASSOCIATION OF ORTHODONTISTS

GEORGE M. ANDERSON, D.D.S.
BALTIMORE, MD.

ABOUT the middle of the year of this administration, I made a report to certain constituent societies which was published in the January issue of our JOURNAL. In that report I told of the "planting season," and now I can tell you of the "crop" made possible through the assistance of responsible committees who have been the life-spring of this Association. To them we are much indebted. No president could hope to be blessed with more able or cooperative assistance throughout his tenure of office. To the committeemen, I express my sincerest thanks, and I feel that the members of this Association can well afford to join with me in these words of appreciation.

1. The Education Committee, consisting of Edward J. Forrest (Chairman), Robert E. Moyers, and Boyd W. Tarpley, with representatives from the American Board of Orthodontics (B. F. Dewel and Frank P. Bowyer, appointed by President Higley), amicably and beneficially cleared differences with the Council on Dental Education of the American Dental Association relating to controls proposed for specialties and specialty boards. Still involved is the orthodontic preceptorship program which, under present Council action, is to terminate in 1967. Further conferences were proposed by the American Dental Association. One in particular was set for April 18, 1960, to consider areas of dental practice. The date selected by the A. D. A. was in conflict with our annual meeting, and a prompt request for a new date was made so that we might have representatives present to place before the conference the viewpoint of this Association in relation to the delineation of specialty areas. The results of this conference are sure to have a far-reaching and long-term effect on the status of dental practice.

Presented before the fifty-sixth annual meeting of the American Association of Orthodontists, Washington, D. C., April 25, 1960.

The general practitioner is not happy about the fractionization of the profession,* and certain specialties will have a problem to justify being so designated. It is a tough situation, and orthodontics will have to be alert to maintain its presently acknowledged specialty position.

2. The committee which the Board of Directors authorized to be appointed from its members to consider the need for administrative assistance met in St. Louis in November, 1959. The directive resulted from preliminary studies made by William Brandhorst, who had been appointed by President Martinek. The results of these studies were reported to the Association at the 1959 meeting in Detroit. The Committee, consisting of Boyd W. Tarpley (Chairman), Elmer F. Bay, B. F. Dewel, William A. Giblin, and Norman L. Hillyer, carried through with its instructions and will present its report and recommendations to the Board of Directors. Transition is frequently difficult, especially in a growing organization where adjustments must come slowly, but we cannot be satisfied with the way things have always been done and we must face the facts. There are areas of usefulness crying for our direction and assistance. Speaking from a year of increasing knowledge and experience, I can say that your executive officers must have help or our fast-growing organization is going to fail to meet its responsibilities. In addition, serving you should be a pleasure for your officers—not a constant battle to survive pressure atrophy.

3. The Necrology Committee is made up of one representative from each constituent society. This Committee, consisting of William Smith (chairman), John Atkinson, Milton B. Asbell, Curtis L. Benight, Arlo M. Dunn, Mason E. Seibel, George Webber, and Angus White, developed and had published in the January issue of our JOURNAL a strong article entitled, "Is Your House in Order?" I hope that it was read by all, for this is one subject about which there can be little disagreement and in which everyone has an interest. Many will recall that this "be prepared" program was initiated by C. F. Stenson Dillon and that he continued to support the idea that no orthodontist is doing the best for his profession, his patients, his dependents, or himself if he does not scrutinize his varied activities in the light of no longer being able to control or direct them.† To Stenson Dillon, all of us express our thanks for insisting that we set aside our sense of complacency and adopt a sense of urgency.

4. The Education Committee prepared and sent to you a letter relating to the need for orthodontic teachers. We had heard criticism that orthodontics was failing the profession in not fulfilling teacher needs,‡ and we therefore have sought to develop a list of those who might be interested in this field, full-time or part-time. In addition, groundwork toward an orthodontic education workshop was laid on April 23, 1960, at a special meeting in Washington of our Education Committee and representatives of orthodontic departments of

*As expressed at the Reference Committee of the American Dental Association House of Delegates hearing in New York, Sept. 15, 1959.

†Editorial: Protect Yourself and Your Interests, AM. J. ORTHODONTICS 39: 952, 1953. (Also see Editorial: The Necrology Committee of the American Association of Orthodontists, AM. J. ORTHODONTICS 40: 228, 1954.)

‡Reference Committee hearing, House of Delegates, American Dental Association, New York, Sept. 15, 1959.

our schools. We also have assurance of cooperation of the American Association of Dental Schools in the organization and conduct of this much needed study. I could quote many affirmative responses to letters that I wrote seeking guidance as to whether a workshop would have advantages. We hope that you will authorize the Education Committee to proceed and bring the workshop into being. It would be a broad-based study of graduate, postgraduate, and undergraduate courses, preceptorship, extension courses, short courses, demand, supply of students, locations, staffing, financing, and many other areas, including that of our relationship with other organizations, affecting orthodontic education and, as a follow-up, membership in this Association. The American Society of Oral Surgeons has a booklet entitled *Essentials of an Adequate Advanced Training Program in Oral Surgery.* A similar explanatory booklet would be advantageous to dentists interested in orthodontics, and it should be available without delay. This should be a "must" from the proposed orthodontic educational workshop.

In relation to this problem, there came to me, unsolicited, during the year a letter with the following proposals:

> That the American Association of Orthodontists instruct its Committee on Education, and that the constituent societies instruct their A. D. A. delegates, to request of the Council on Education of the American Dental Association, the enactment of the following stipulation for grade A recognition of American dental schools:
>
> 1. Any dental school, to be recognized as a grade A school will have as a separate unit any proposed or existing graduate orthodontic department, postgraduate orthodontic department, or other administrative or clinical entity, which has charge of training that leads to a certificate, diploma, or degree in the art and science of orthodontics.
>
> 2. Said unit, division, department, or other administrative or clinical entity will not be a part of or under the jurisdiction of any existing or proposed pedodontic department, or other comparable administrative or clinical group.
>
> 3. Furthermore, in order for the dental school concerned to be listed as a grade A school, the chairman or head of the orthodontic department, division, or other administrative or clinical entity which has charge of the training that leads to certificates, degrees, or diplomas in the subject of orthodontics will be a member of the American Association of Orthodontists.

You can see that the educational and related organization aspects of our Association are quite involved and that they deserve careful thought and analysis by our membership.

5. The Insurance Committee is made up of Nathan G. Gaston (chairman), Walter R. Bedell, Robert L. Deshong, David C. Hamilton, Richard M. Railsback, consummated through Treloar and Heisel, Agents, a useful disability and death policy which is now in effect, covering about half of our members. A short time later arrangements were made to include associate members of our constituent societies. You were well informed about this insurance, and the response has been gratifying. Last year you were thinking about it; this year you have it.

6. Most members have not seen our *Annual Meeting Operating Manual.* They should see it. It is a detailed statement of what must be done by our elected and appointed representatives to organize and conduct our annual

meeting. The growth of our Association has created complications with respect to hotel accommodations and program arrangements for which we must plan before they get the best of us. They have been a major concern for this meeting. Without the manual to guide us, preparations for a gathering such as this could readily become chaotic. With it there are controls, but to be really useful they must be revised and rewritten according to existing circumstances. The Manual Committee consisting of Scott Holmes (chairman), George Anderson, Robert E. Coleman, Samuel D. Gore, Sr., Wilbur Prezzano, and John R. Thompson, is one that I believe should meet for discussion during the year, as it is practically impossible, with this increasingly difficult problem, to do much by letter or by telephone.

7. The Qualifying Committee, which consists of J. Lyndon Carman (chairman), Philip E. Adams, Frank P. Bowyer, Milton R. Culbert, Robert E. Gaylord, George W. Hahn, Merlin A. Spain, and Clifford A. Whitman, has the responsibility for coordinating orthodontic educational requirements as they relate to association membership. It involves the preceptorship field and other areas of orthodontic preparation. Each constituent society is represented on the Committee, and each society has its rules directed by a local committee. Reasonable uniformity is essential and, although some have doubted this possibility, our Qualifying Committee is fulfilling its obligation. The make-up of the A. A. O. Master Qualifying Committee should not be subject to frequent change, for to perform its duties properly it has to be exceptionally well informed as to what is happening on the local level and it must be able to adjudicate and reconcile differences, which only an experienced group could do. In other words, the chairmanship of the *constituent* Qualifying Committee should be one of reasonably long tenure, say five years, so that the chairman would automatically continue for a period of useful service on the parent supervisory and control committee. Dr. Carman called the Qualifying Committee to meet in Washington on April 23, 1960, for a discussion of problems of both local and national levels.

8. We were instructed by the Board of Directors to continue discussions which started a year or so ago with pedodontic and pediatric associations so that areas of mutual interest might be better understood by all. It was hoped also that areas of controversy or conflict might be adjusted and that embarrassment resulting from careless or unpolitic verbal and written statements might be averted. We selected the name of "Related Organizations" for this Committee, which is made up of Ernest T. Klein (chairman), H. Curtis Hester, C. Edward Martinek, and Herbert V. Muchnic, since we believed that sooner or later we might have reason to work with or confer with other organizations beyond the two mentioned. Negotiations have progressed favorably and far enough to indicate that it is proper to provide our share of funds to hold a joint conference. I hope that this will be done, so that the preliminary work during this past year will not be lost through failure to support the project.

9. The Second Cephalometric Workshop, under the direction of J. A. Salzmann (chairman), Allan G. Brodie, T. M. Graber, L. Bodine Higley, Robert E. Moyers, and consultants B. Holly Broadbent, William B. Downs, W. M.

Krogman, Herbert I. Margolis, and Wendell L. Wylie, with participation by invitation, met in Cleveland in July, and the extent of the discussions is indicated by the extensive volume which has been prepared from the activities of the conference. A detailed report is being given by Dr. Salzmann at the Research Section meeting on Tuesday afternoon (April 26). I want to express our appreciation for the gracious assistance of Mr. Charles Bolton and his mother, Congresswoman Frances Bolton, President Millis of Western Reserve University, Dean Werrin of Western Reserve University Medical School, Dean Boyle of Western Reserve University School of Dentistry, and B. Holly Broadbent toward the success of the conference. The United States Public Health Service, through the National Institutes of Health, financially contributed to making the conference possible. We are grateful to them for their aid.

10. Along somewhat similar lines, we gave the full support of this Association to a request for funds from the United States Public Health Service for a Conference on Growth to be held at the conclusion of this meeting at the National Institutes of Health by the advisory group (Charles J. Burstone, chairman) to the Research Section of this Association. The A. A. O. Board of Directors authorized by budgetary allotment a contribution of $600.00 toward the planning for this event, and the Charles H. Tweed Foundation for Orthodontic Research (Ben L. Herzberg, president) contributed $1,000.00 toward the support of the conference. This is recognized as a gracious voluntary act on the part of the Tweed Foundation. While the United States Public Health Service request was denied, it was not prejudiced; we were told what we should do toward later approval, and this is being done. We look forward to later success for this project, and the necessary preliminary planning conference is being held immediately following this meeting.

The foregoing activities were carried on by special committees in your interest during the past year. Their accomplishments have been splendid and are not only to their credit but to the benefit of every member of this Association.

Do not think that this is all that has gone through the mill during the year, for our elected and other appointed committees have been actively providing the core of strength so essential to the progress of a large group like the A. A. O. Each functions in its field; without them you would be at a near standstill, for your executive officers simply could not cover the ground or produce the needed results. One specific thing has come out of my observations relating to committee work: Provision should be made for several of them to meet during the year to discuss thoroughly problems which are often too difficult or extensive to handle by telephone or letter. As an example, though it is not a regular committee but a special committee, the Qualifying Committee decided to meet prior to this session in Washington. They have a lot of responsibilities and difficult problems, and the Committee must have the opportunity to solve them. For all practical purposes, this will be a regular committee for sometime to come, for even if the preceptorship is eventually abolished there will still be problems concerning membership and the applicants' qualifications. Another example of those committees with duties warranting a discussion

meeting is the Public Health Committee, composed of J. A. Salzmann (chairman), L. Bodine Higley, Ernest L. Johnson, Solomon J. Kessler, and Oren A. Oliver. It also called a conference for April 23, in Washington, at which Dr. David Ast (New York State Department of Health) was asked to speak on the distribution of orthodontists and related public health problems.

In support of the opportunity for these committees to meet, I quote from a letter written by the chairman of the Education Committee (Dr. Forrest) to a member (Dr. Moyers): "I don't suppose we will have an opportunity to meet as a Committee in the near future, but I think we should have an opportunity to discuss some of the problems now resting with the Education Committee before any definite action is taken."

I suggest, therefore, that an allotment of at least $4,000.00 be included in the annual budget for the expenses of various committee meetings which are approved by the Ad Interim Committee as essential to the operating welfare of this Association.

Administratively, we are becoming too large and have too much business for your executive officers to handle without advice, and to try to get it by telephoning and letter writing is not very satisfactory. Therefore, I believe that we have come to the time when we should have a directors' meeting between annual meetings. Not only will this lead to decisions based upon a cross section of thinking, but it will lessen to a marked degree the tremendous mental effort to make the right decisions required of your president between the annual meetings. It will also permit the directors to be better prepared at the time of the annual meeting to bring to full consideration and conclusion the business of the Association. While such a meeting might cost as much as $5,000.00, that represents but $2.50 per present member. It is a small amount individually to allow us to attend to our affairs properly and with greater benefit to all.

We have had the truly devoted services on the Budget Committee, which is composed of Herbert V. Muchnic (chairman), George H. Siersma, and Harold S. Born, of able and experienced financial guidance. We now take in a lot of money; we spend a lot of money. In fact, I think that the name Budget Committee no longer is appropriate. It seems to me that Finance Committee more fully covers the increasing duties that this committee faces. Our income and expenses should be thoroughly studied from facts and figures accumulated during our growing years to serve as a base for plotting our future course. We will then know what we are doing, why we do it, and whether we are doing the best with what we have. The cost of living seems to be moving ever upward, and so is the cost of administration and of the annual meeting. Our budget will continue to rise, and approving annual expenditure of close to $50,000.00 to best advantage will require time, thought, and knowledge—all difficult to provide in the rush and bustle of the annual meeting. Earlier consideration would also give the directors a better opportunity to face their responsibilities than is possible when the budget is presented and adopted, as in the past, within a very short time. We have not done badly—in fact, we have done very well—but we are growing rapidly and our methods must change to fit the conditions.

There are other committees with increasing problems, but to prolong substantiation of the above suggestions as to meetings will only lengthen this address. I would be remiss in my duties, however, if I did not emphasize those which have been so forcefully impressed upon me.

A suggestion relating to membership was made to me during the year. It is that we adopt a life membership available to persons who have been members for thirty-five years and who have attained the age of 65. The proposal should receive careful study because of the effect upon our income. Under the subject of membership, there is another serious problem. Regardless of graduate schools and preceptorships, we have entering the field of special practice each year a fair number of dental practitioners who are not eligible for membership in this Association. Should we let this situation continue with the possibility of another organization being formed which, as far as the public will be able to know, will be equal to the A. A. O.? A few states have specialty laws, but most dental practitioners today have the legal right to specialize. If you feel that this problem is going to intensify, I believe that we should have a committee to consider it. The Qualifying Committee might assume this duty, although if it thinks that it has enough on its hands a separate and distinct committee could have this problem as its sole responsibility.

Our tax status is still in poor shape. The creation of the Mershon Trust brought this matter to the fore. The Federal tax authorities say that we are a business, not a professional scientific body. We do not agree with this. We have consulted with the American Dental Association and have retained legal advice since, if the Federal preliminary decision is sustained, it could result in considerable future expense not only in our operations but in the field of gifts and financial support.

Though the question of our fiscal year is mainly an administrative one, it is set in our constitution and if a change is desired it has to have your approval. Therefore, since it is difficult to get all bills in and paid within the two months now allowed following the close of the annual meeting, we suggest that the fiscal year be changed from July 1 to August 1. The treasurer can amplify this if anyone wishes more reasons for making the change.

If this organization does not choose to have a full-time executive or administrative secretary to direct its increasing business and run its annual meeting, it should seek employment of a firm skilled in managing an annual scientific meeting. Several were suggested, and three firms and individuals contacted us during the year. It is becoming most difficult for busy practitioners to devote the necessary time to arranging the details incident to local arrangements and to see them carried out. It actually represents a terrific waste of time and labor, for as we do it now a new team must go to work each year. What has gone before means little, even though we have a finely developed manual and the advice of previous committees who willingly give of their time to aid the newly activated committees. This should be considered an important area in the master plan of reorganizing our administrative work, and it can be done if we provide the funds and the staff to do it.

I call your attention to the need for additional funds to allow us to operate as we should. Our capital funds amount to about $65,000.00. This is not an excessive backlog. Our dues of $20.00 annually leave but $13.00 per member (about equal to what we pay for a single ticket to our dinner dance) after we pay the $7.00 JOURNAL subscription. Our total take is considerably less than our expenditures. If we did not have application and attendance fees and commercial exhibits annually we would run at an annual deficit—this year about $10,000.00. We start, therefore, with a need for about $4.00 per member, or $8,000.00, additional to break even under present income and costs, for application and attendance fees and the income from commercial exhibits are not a secure financial background. We shall need about $9.00 more per member ($18,000.00) to install the new business organization. The committee to study this problem suggested that about $10.00 per member would be required for this purpose. We shall need about $4.50 per member ($9,000.00) to provide for directors and committee meetings and to allow for attendance at conferences to which we would be remiss in not sending representatives. We should have at least $1.00 more per member ($2,000.00) as a cushion.

These suggestions total $18.50 per member ($37,000.00), and even so they add only to $31.50 per member annually (or $38.50 including subscription to the JOURNAL) for an association of the caliber that we like to think the A.A.O. is. While it does represent more than a doubling of the present dues, it is in keeping with the doubling of our activities and provides for their moderate increase. Therefore, let us match our ideas and the position we have professionally with our money and have a breadth of vision that overrides our usual innate caution. Even then we will not be "living fancy."

I close on a series of happy notes.

The American Board of Orthodontics, made up of L. Bodine Higley (president), Frank P. Bowyer, B. F. Dewel, Alton W. Moore, Paul V. Reid, J. A. Salzmann, and Wendell L. Wylie, performs an integral and extremely vital function in orthodontic progress, and I know of no one thing of more importance that the American Association of Orthodontists has ever done than the creation of this Board. We are proud of the Board and of its past and present members. They have given freely and willingly of their time, thought and effort to make the A.B.O. diploma a prize to be sought after. We created this year a Local Liaison Committee, consisting of Stephen C. Hopkins, Sr. (chairman, an ex-Board member), Paul Hoffman, and Francis Murray, to aid in making arrangements and to see that any needs not anticipated would be filled with a minimum of burden on the Board members.

During the year many facts were impressed upon me that I knew without fully realizing. You have in Dr. Shepard an able coordinator of business activities. He is behind the president's efforts in a quiet and helpful way, never seeking to impose his will and yet always a valuable advisor and associate in the furtherance of essential organization duties and problems. We have in our editor, Dr. Pollock, a person who can always be counted on to assist in the transmission of vital information to our members through the pages of our

JOURNAL. He replies promptly, he gives sound advice, he gets out the news without delay, and his editorials have been most helpful. Additional assistance has come from the Publications Board and in particular Dr. Dewell, who wrote accurately and positively about our specialty and specialty board problems during this controversial year. Dr. Salzmann's editorial assistance and constant support to keep several of our various irons hot helped immensely. He and Dr. Erikson represented us at a Conference of National Organizations for children and youth in September, 1959, in Washington. In April, 1960, Dr. Salzmann (chairman of our Public Health Committee) and Dr. Aldrich (chairman of our Public Relations Committee) represented us at the White House Conference on Children and Youth. This is a tremendous affair, held every ten years, with about 3,000 in attendance. Dr. Clifford Glaser was asked to represent us at a testimonial dinner honoring Mr. Reginald Williams in Buffalo in November, 1959, at which Mr. Williams was presented the Frank J. and Franchot Tone Award of the American Institute of Mining, Metallurgical and Petroleum Engineers. Mr. Williams has been a long-time contributor to our technical problems, and Dr. Glaser spoke of our appreciation to the assemblage. Dr. Wendell Wylie, on his trip to speak before the Uruguaan Congress, carried a letter of greeting from the American Association of Orthodontists and he reports an appreciative reception. Our relations with the American Dental Association are excellent. We asked President Jeserich to be with us, but many previous long-term engagements prevented it. He will be ably represented by Dr. Camalier, the A.D.A.'s Washington representative and a warm personal friend of many of us. When we asked Dr. Daniel Lynch to help us in some governmental contacts, he responded promptly and we express our thanks for his assistance.

When possible I attended constituent society meetings. I came away impressed with the character of their administration and the quality of their programs. I suggest that, whenever possible, members of the A.A.O. take advantage of these fine educational opportunities and attend constituent society meetings. I congratulate our units on the high level of their achievement, and I admire the devoted service of their officials.

I am happy to have been your presiding officer for 1959-60, but I must admit that the job was bigger than I had any idea it would be. To my successors, I wish highly favorable and productive administrations.

3700 N. CHARLES ST.

A FOUNDATION FOR CEPHALOMETRIC COMMUNICATION

ROBERT MURRAY RICKETTS, D.D.S., M.S.,
PACIFIC PALISADES, CALIF.

INTRODUCTION

THE purpose of this article is to inform the clinical orthodontist of the value of the cephalometric roentgenogram. The findings on 1,000 clinical cases are reported to provide an adequate sample for description, comparison, and classification of clinical problems. The first part deals with a superficial survey of gross features; the second part deals with the consideration of deep structures.

This article has been prompted by several observations. Many clinicians find cephalometrics indispensable to their practices but are loath to explain exactly why. Others still seek from this method a magic formula for treatment instead of using common sense. Some clinicians never critically evaluate films with tracings, while others are hypercritical with the technique to the point of making an issue of 1 degree or less in tooth angulation. The whole subject of oriented head radiography has come to be mistakenly identified with "analysis." Many schemes have been presented with no purpose or reason other than the individual preference of the investigator. The result has been a confused and sometimes misleading application of this tool, as has been shown by Krogman and Sassouni[1] and by Lindquist.[2]

Although the technique was described in 1931,[3] clinical cephalometrics started with analysis of treated cases in 1938.[4] By 1948 the headfilm had been employed for assessing facial relationships and diagnosing malocclusion.[5] The method came to be embraced as a medium for evaluating teeth over so-called basal bone; hence, it was, in part, grasped most readily by those who accepted the doctrine of extraction.[6] It was argued, however, that this relationship could be evaluated with arch length studies on dental casts.[7] Many other clinicians pointed out that static analysis did not constitute a prescription for treatment and that those employing the method overlooked growth and human variation.[8] Consequently, the whole method was challenged by both clinicians and research men as a device for study and treatment planning at the clinical level. Let us now take inventory of our present status and see where we may be headed with clinical application.

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood that it does not necessarily represent or express the opinion of the Board.

Read before the American Association of Orthodontists, Washington, D. C., April, 1960.

Björk,[9] in 1954, reviewed the whole subject of cephalometric research investigations and noted many aspects. Sassouni, likewise, reviewed various methods. I[10] classified the subject primarily for the thinking and orientation of the clinician as follows:

1. Equipment and cephalometric procedure.
2. Radiographic interpretation (subjective).
3. Cephalometric survey or analysis (objective).
4. Evaluation of growth and treatment effects (objective).
5. Cephalometric synthesis-treatment planning (subjective and objective).

Let it be emphasized that a cephalometric description and classification of the skeleton and of the malocclusion is one subject, that of a survey or analysis.

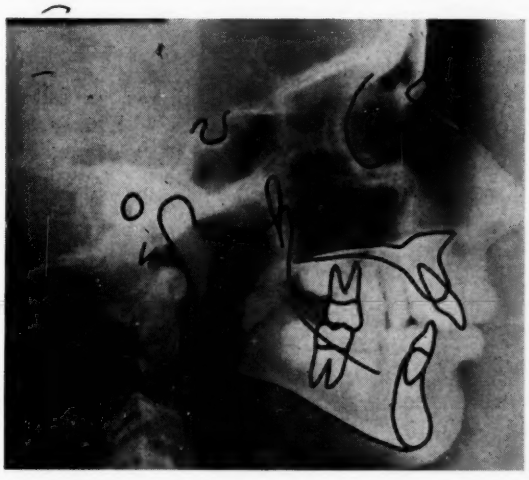

Fig. 1.—Typical Class II, Division 1 malocclusion in a 12-year-old girl. Lateral cephalometric roentgenogram with pertinent structures traced. For demonstration purposes, an ink tracing was made on cellophane, although acetate paper and a medium lead pencil are usually employed.

Planes and points of reference are established from basic structures. Note midsagittal structures of sphenoid bone, base of occipital bone, nasal bone, maxilla, "ear hole," and left "eye socket." When poor positioning or asymmetry prevails, lateral structures are bisected. All buccal teeth on the left side, the vertebrae, and the soft-tissue structures are routinely traced by the author, but the above represents the most typical structures for the present article.

Treatment planning is a distinctly different subject, that of a synthesis. A short treatment planning procedure, based on growth and possibilities of change during treatment, has been established. However, planning and other factors of cephalometrics listed above must be dealt with separately. The standpoint is taken here that you cannot know how to treat a case until you know what you are treating! The present work, therefore, must come first in order to establish references for communication of problems. Thus, I shall limit this study to the survey and the analysis, with only enough related material to give proper perspective and emphasis to the subject at hand.

Semantics of Cephalometric Analysis, Survey, and Synthesis.—Cephalic pertains to the head; *metric* means measurement. Cephalometric roentgenography thus means head measurement with the x-ray (Fig. 1).

Many clinicians doubt the necessity of establishing reference planes, angles, and linear measurements. The crux of the need for measuring is stated by Moroney,[11] who says: "It is always useful when we can measure things on a ruler instead of simply calling them 'big' or 'small.' "

An angle theoretically expresses proportion. Direct comparisons are made with linear measurements. Thus, systems are established to define in numerical values the relationship of parts of the head. These methods have been called cephalometric analysis.

Certain differences in meaning should be understood with reference to the terms "analysis" and "survey" as employed in this study. Analysis is an *objective* procedure, for measurements make it necessary to apply impersonal or unprejudiced criteria. *Analysis is thus determined by emphasis on the features or characteristics of the object rather than the thoughts or feelings of the operator.* Any process of study or inquiry is, in a sense, analysis. To analyze literally, however, means to separate or to resolve into constituent parts. True cephalometric analysis consists of dividing the skull into cranial and facial components and considering these parts as they independently affect the whole.

Many types of cephalometric designs, however, should be more accurately called surveys. The term "survey" suggests a comprehensive view of the structure as a whole. It further expresses the delineation of form, extent, or position of parts. The philosophy of the cephalometric survey is that the clinician wants, first of all, to recognize a problem, if one exists, and then to deal with it more specifically if necessary.

A compromise thus seems appropriate and attractive to the clinician who must study numerous cases daily. Ideally, a survey should be simple and yet sufficient to yield an adequate impression of existing conditions for practical purposes. This is particularly important in the case of the profile. More detail and landmarks can later be added for the explanation of findings in the profile.

Purpose of Analysis.—The first purpose of a clinical cephalometric scheme should be to *characterize* or describe the pertinent features of the patient. One person can be *compared* with another by comparing values of size and proportion. A *classification* of various relationships can be established through the division of values into specific quantities. Quantitation thus provides a means of *communication* of the problem. Therefore, the survey or analysis can be employed to *describe, compare, classify,* and *communicate* the nature of orthodontic-orthopedic problems. When employed with this idea, it makes common sense. The survey is thus only a quantitated description. Attempts should be made to make it as simple, revealing, and workable as possible for broad mutual education.

As stated above, treatment planning with cephalometrics may be best understood by calling it synthesis. The term "synthesis" is the opposite of analysis. To synthesize means to combine or compose so as to form the whole; synthesis also means the product thus formed. Synthesis requires the consideration of changes in isolated parts that contribute to the whole (for instance, the *growth* of the mandible as it affects the face).

In treatment planning, objectives or desired changes must be described rather definitely. During treatment growth is of primary importance. Movement of teeth must be planned on the basis of past experiences. Furthermore, the natural physiologic change or induced change in the posture of the mandible must be taken into account. The influence or the adaptation of the tongue and the lips must be recognized. The possibility of alteration of basic maxillary structure beyond the alveolar bone is a vital concern. Finally, growth and change in the soft tissues of the nose and the chin are important to an appreciation of harmony in beauty and function.

Synthesis or treatment planning has been mentioned here only to help orient the reader concerning the relationship of analysis to treatment planning and to prevent some of the misapplications common to a static description.

METHODOLOGY

In order to understand and follow the reasoning, methodology, and findings, it is imperative that certain anatomic points and landmarks be memorized. For the purpose of the survey, fifteen points of reference are used, as outlined in Fig. 2. (See Glossary.) These landmarks are connected to form only two essential angles and three linear measurements, thus yielding five values for consideration in the survey.

The reasons for the selection of these points and planes in preference to others will be discussed later. Other points and angles were added for a more definitive evaluation of isolated parts or analysis in specific cases. These will also be explained later. When practical, the means and standard deviations are reported in round figures to permit easier communication and to increase the usefulness of the information.

MATERIAL

Material for this study was gathered entirely from the records of my private practice. A few cases had been referred for consultation by other orthodontists. Otherwise, the sample consisted of 1,000 consecutive cases with a "usual" orthodontic problem. All surgical Class III cases, traumatic temporomandibular joint cases, and operated cleft palate cases were omitted. The breakdown is seen in Chart 1, together with a comparison with Angle's findings in 1898.

SEX		AGE (YEARS) MEAN: 8.9 YEARS	CLASSIFICATION	RICKETTS 1958	ANGLE 1898
Female	546	3 to 6— 61	Class I	399	692
Male	454	7 to 10—497	Class II, Div. 1	367	124
		11 to 14—343	Class II, Div. 2	217	142
		15 to 18— 66	Class III	17	42
		19 to 44— 33			
	1,000	1,000		1,000	1,000

Chart 1.

FINDINGS

Certain references were selected in order to describe the face in terms of *depth, height, width,* and *bony profile contour.*

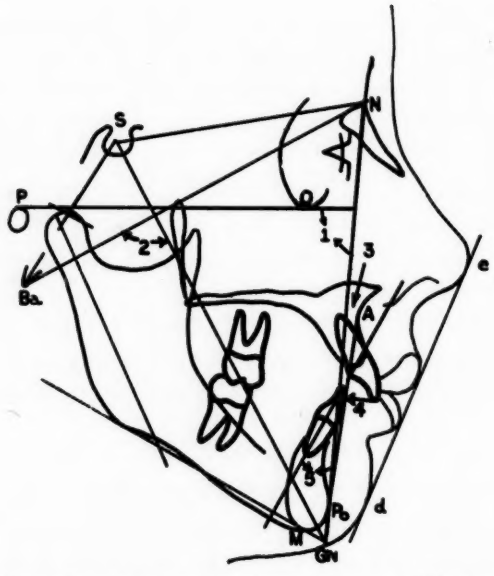

Fig. 2.—Planes and points erected on tracing of the case illustrated in Fig. 1.

S = Sella, center of sella turcica.
N = Nasion, junction of nasal and frontal bones at the anterior end.
Ba = Basion, anterior border of foramen magnum.
P = Porion, top of external auditory canal.
O = Orbitale, lower border of orbital cavity.
A = Point A, deepest point on the curve between the anterior nasal spine and the alveolar bone.
Po = Pogonion, most anterior point on the mid-sagittal symphysis.
M = Menton, lowest point on the symphysis.
Gn = Gnathion, or prognathion, point on the symphysis at crossing of the Y axis which is determined by intersection of facial and mandibular planes.

Angles and points of measurement are numbered as follows: *1*, facial angle; *2*, XY axis angle; *3*, measure of contour; *4*, lower and upper incisor tips to the APo plane; *5*, angle of the lower incisor to the APo plane.

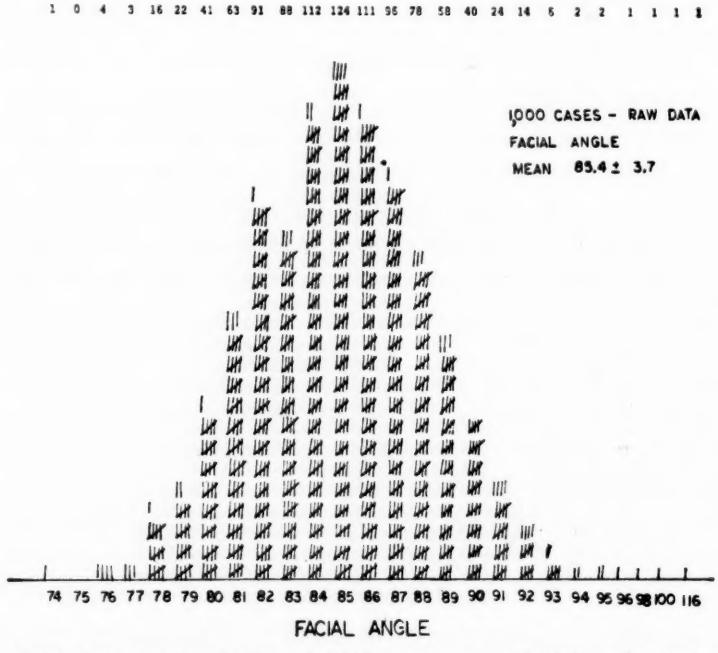

Fig. 3.—Score sheet showing distribution of 1,000 cases on the facial angle measurement. Note the normal curve and frequency of cases with facial angles of 84 to 87 degrees.

Indicator of Facial Depth—The Facial Angle (Fig. 2, *1*).—Most of our problems in orthodontics concern relationship of the jaws or arch length. Therefore, the first concern was the anteroposterior assessment of the location of the chin.

The intersection of the Frankfort horizontal plane with the facial plane forms almost a right angle—the facial angle. It has been selected here, as advocated by Downs,[5] as a facial depth indicator. In order to overcome the error frequently manifested by using the ear rod of the cephalometer for the cephalometric porion, the superior aspect of the external auditory canal (EAC) was selected by inspection on the x-ray film. This point was thus employed for the dorsal limit of the horizontal plane, but it is not porion as previously employed.

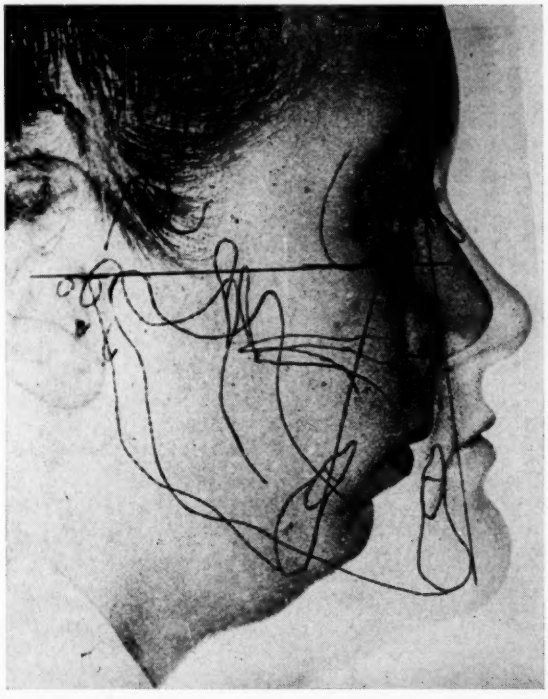

Fig. 4.—Two different persons compared by superimposing tracings on the Frankfort horizontal and registered with nasions perpendicular. The retrognathic face had a 74 degree facial angle; the prognathic face had a facial angle of 96 degrees. This angle suggests the depth of the chin to craniofacial references.

The findings in the 1,000 cases revealed a mean of 85.4 degrees and a standard deviation of 3.7 degrees (Fig. 3). The use of this angle suggested that 1 degree of difference represented about 1.5 mm. of difference in position of the chin relative to the forehead or nasion point (Fig. 2). Thus, a patient with 74 degree facial angle may exhibit a chin that is 30 mm. shorter in relation to the forehead than a patient with a 96 degree facial angle, as seen in Fig. 4.

Indicator of Facial Height—The XY Axis (Fig. 2, *2*).—There is strength in the selection of more than one cranial reference plane, especially if the reference points are removed from each other as far as possible and are selected for

different purposes. A reinforcement of interpretation, therefore, is provided by two craniofacial reference planes.

Much work is underway to determine which angle would be the best indicator of facial height. The XY axis angle, however, has been found useful and informative in this investigation. Basion-nasion is a cranial plane (basicranial axis of Huxley). The crossing of this plane with the Y axis (SGN) forms an angle called the XY axis angle. In the present sample this angle also was scattered around a right angle in a pattern similar to the facial angle variation and helped describe forward or backward divergent faces. Measured from basion, it was interpreted as plus if it was more than 90 degrees and as minus if it was less than a right angle. Thus, a +5 degree inclination of the XY axis is 95 degrees. Differences of 1 degree represent almost 2 mm. of height relative to depth when registered in this manner, due to the length of the Y axis.

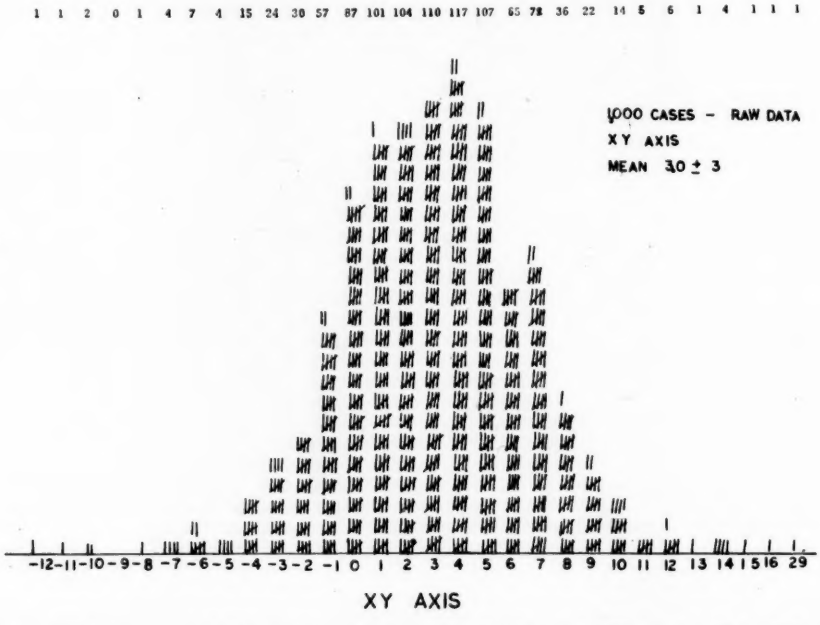

Fig. 5.—Histogram of 1,000 cases showing distribution of XY axis. The XY axis was measured from the basion-nasion plane and read as plus or minus from 90 degrees. Low readings to the left suggest facial height. High readings to the right suggest shortness and depth of the face. Note the frequency of +1 to +5 degrees (539 cases in this range). The mode is +4 degrees.

The average angle in the cases studied was 93 degrees, or +3.0 degrees. The range in variation was found to be from −12 degrees to +29 degrees (Fig. 5). The standard deviation was 3 degrees. This suggested that cases less than zero tended toward greater length in facial form as opposed to depth. Cases more than +6 degrees thus tended toward a short face or demonstrated a prognathic relationship of the chin to the basicranial axis. Fig. 6 shows a long, shallow face contrasted to a short, deep face as suggested by this method (also see Fig. 19).

The XY axis angle supports the facial angle. When both are used as yardsticks for classification, the chin can be rather critically located. The chin

was thus evaluated to be upward and forward, downward and backward, upward and backward, or downward and forward by comparison.

It should be restated that the purpose of this survey procedure is the description of different facial types. It merely suggests the relationship of facial parts and permits classification, comparison, and communication of what is seen on the headfilm. The survey does just that. Nothing more is intended.

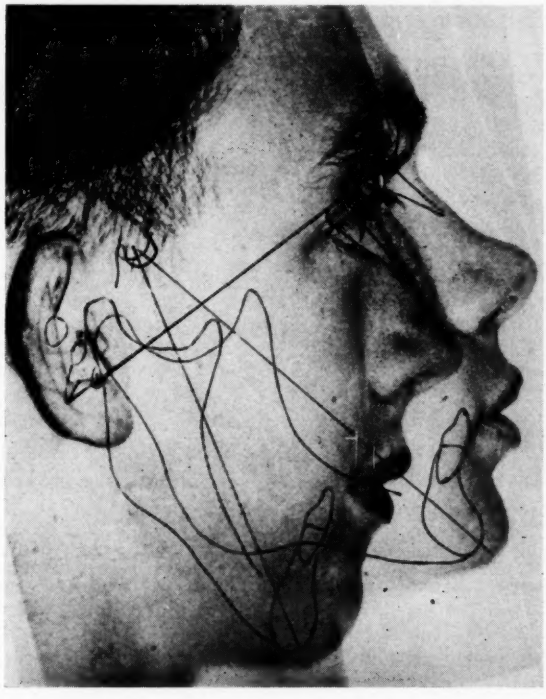

Fig. 6.—Two different patients compared by the XY axis, with basion-nasion planes superimposed and registered on sella. The long retrognathic pattern shows an XY axis of −12 degrees. The short prognathic face has an XY axis of +14 degrees.

Facial Width Indicator.—Facial width sometimes is broadly interpreted on the basis of the *subjective* viewing or measuring of the frontal headfilm. In some cases, width also might be surmised by interpretation of the facial angle and the XY axis. Faces of the short, prognathic type (chins upward or forward) are frequently broad or brachycephalic in pattern. Class I and Class II patients with long, retrognathic patterns (chins downward and backward) usually display high mandibular plane angles and narrow, pointed chins. Many exceptions can be found which point out the need for the frontal film.

For those interested, the mandibular plane was measured, yielding a mean of 25.7 degrees with a standard deviation of 5.9. The range observed was from −11 to +46 degrees. The resulting curve suggested a normal distribution. I was surprised to discover that I had inadvertently dropped this measurement in routine use when these data were accumulated.

Facial Contour Indicator—Point A to the Facial Plane (Fig. 2, *3*).—Some dilemma has occurred regarding methods and points for determining the rela-

tionship of the maxilla to the mandible in the bony profile (Fig. 7). A point selected in the maxilla at the junction of the alveolar bone with the root of the anterior nasal spine has been termed point A. Downs[5] described this point as a working point for purposes of cephalometrics and selected it to represent as nearly as possible the anterior limit of true basal bone in the maxilla. A similar point, called point B, was selected on the mandible. We have not burdened ourselves with the use of point B when pogonion undeniably represents basal bone and not alveolar bone.

A. *B.* *C.*

Fig. 7.—Contour of the skeletal profile measured directly from point A to the facial plane. *A*, A concave face of 8 mm.; *B*, a convex face of 12 mm.; *C*, a comparison of the two cases as seen in the soft tissues with the facial planes superimposed and registered at the palatal plane.

Downs assessed convexity by measuring the variation of the reflex angle NAPo. He read the angle forward or backward of 180 degrees. Riedel[12] suggested that the difference of angles SNA and SNB be used as an indicator of maxillomandibular basal relationship. The difference in the angles SNA and SNPo also measures maxillomandibular relationships. However, we were concerned with basal skeletal relationship or skeletal contour.

At the usual distance from nasion to point A, 1 degree of difference from the line NA to the facial plane equals about 1 mm. on an arc from point A to the facial plane. Therefore, a direct measurement from point A to the facial plane was selected to yield true variation of the profile from a straight line.

When measured in this manner, a reading of 10 mm. of distance from point A to the facial plane yields about 20 degrees of convexity as measured by Downs or about one half that angular value in millimeters. The difference between SNA and SNB would yield a difference to the above depending upon the position of point B, namely, retrusion or protrusion of teeth and alveolar bone on the mandible (Fig. 10).

In this sample of 1,000 orthodontic cases, convexity was found to be as much as 12 mm.; concavity also ranged to 12 mm. (Fig. 8). In the average case convexity was observed to be 4.1 mm. (Fig. 2). The standard deviation was 2.8 mm., which meant that in 67 per cent of the cases convexity fell between 1

and 7 mm. The distribution curve was skewed, with the mode being about 5 mm. (Fig. 9).

Faces displaying convexity or concavity of no more than 2 mm. were thought to be essentially and practically straight faces. Faces with up to 5 or 6 mm. of convexity or concavity were classified as moderately convex or concave. Cases in which the distance from point A to the facial plane approached 10 mm. or more were described as severely convex or concave (Figs. 7 and 8).

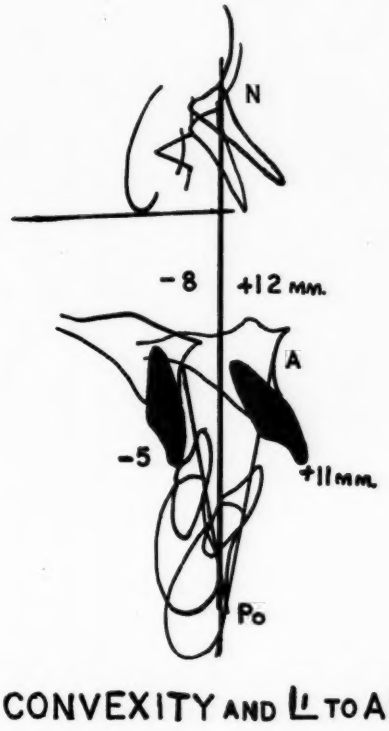

Fig. 8.—Comparison of the profiles of the patients shown in Fig. 7. The facial plane is registered at the palatal plane. The upper incisors are also shown in relation to the APo plane and the facial plane. Note the adaptation of the lower incisor to facial contours.

Facial contour was broken down into the five age groups or dentition groups in an effort to shed some light on the frequently expressed opinion that "adults have straighter faces than children." The findings (Chart 2) revealed a progressively smaller dimension from point A to the facial plane as age increased.

AGE (YEARS)	MEAN CONVEXITY (MM.)	$\overline{1}$ TO APO (MM.)	LOWER LIP TO E PLANE (MM.)
3 to 6	5.5	−0.9	+0.9
7 to 10	4.4	+0.4	+0.7
11 to 14	3.7	+0.7	0.0
15 to 18	2.5	0.0	−1.9
Adult	1.7	0.0	−4.0

Chart 2.

Thus, a rather rapid decrease was suspected in the prepubertal ages, with a gradual tapering-off in older age groups. These comparisons are only of age groups, but the findings are consistent with Lande's[13] longitudinal studies.

Indicator of Denture Position—The Point A-Pogonion Plane (Fig. 2, *4*).—Since we are attempting to *describe* the position of teeth and to communicate the findings, it seems advisable to use a line of reference that can be interpreted readily. The *distance* of the anterior teeth to a reference plane was employed in preference to an angle, since an angular measurement does not describe the spatial relationship.

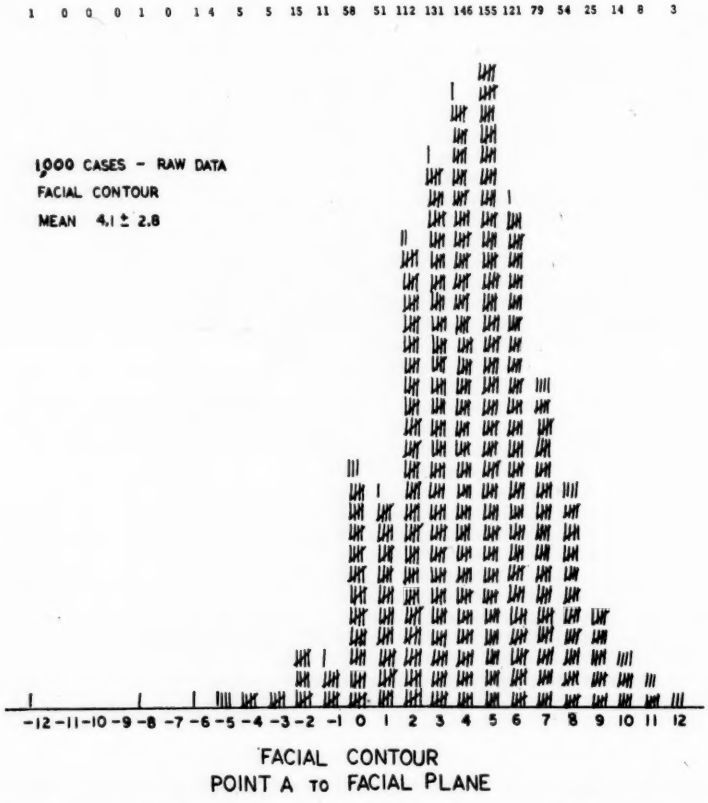

Fig. 9.—Score sheet showing variation in facial contour in 1,000 clinical cases. Spatial relation of point A to facial plane was measured. Note frequency of 2 to 6 mm. convexity (665 cases).

Point A and pogonion have already been designated as the anterior limits of basal bone in the maxilla and mandible in describing maxillomandibular relationship. These same reference points, connected by a line, were therefore employed for locating and describing the incisors. This plane was thought of as the dental plane or denture plane, in contrast to the facial plane. The incisal tips of the upper and lower incisors were thus measured to the APo plane. I considered this measurement as the most revealing to the orthodontist in the entire survey.

Lower incisor to APo plane: In our sample of 1,000 orthodontic cases, the average lower incisal tip was located approximately 0.5 mm. anterior to the APo plane (Fig. 10). One standard deviation was 2.7 mm. The range of variation was found to be +10 mm. to −10 mm. (Fig. 11).

A line through the long axis of the lower incisor was also measured to the APo plane for recording the inclination of that tooth (Fig. 2, *3*). The incisor was noted to incline at an average angle of 20.5 degrees to this line (Fig. 10). One standard deviation of inclination was 6.4 degrees. The total range in angulation was from −11 to +53 degrees. Thus, the range of 1 standard deviation was 15 to 27 degrees (Fig. 12).

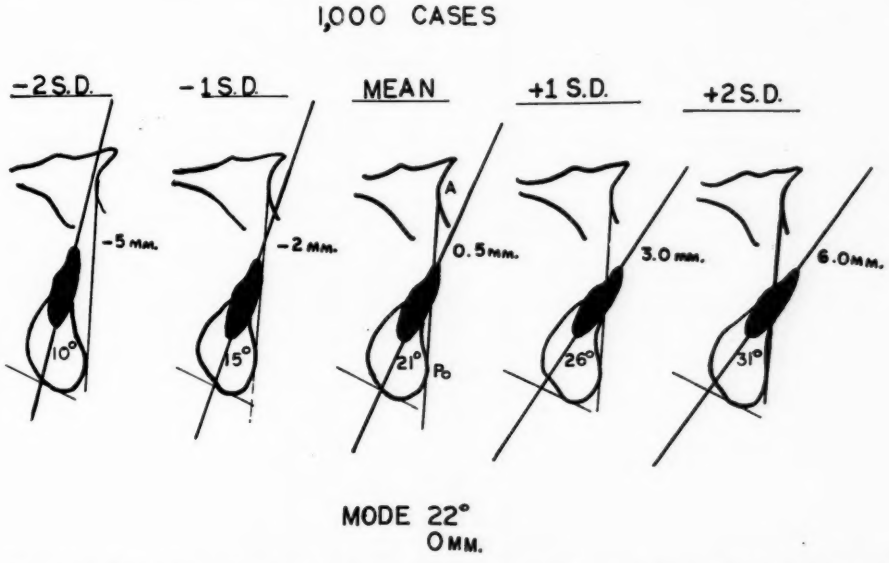

Fig. 10.—The APo plane to the lower incisor in position and inclination (incisal tips and long axis). Mean and approximately 1 and 2 standard deviations from the mean. In the center figure the average for the lower incisor is 0.5 mm. at 21 degrees. The low of 1 standard deviation is −2 mm. at 15 degrees. The low of 2 standard deviations is −5 mm. at 10 degrees. The high of 1 standard deviation is +3.0 mm. at 26 degrees. The high of 2 standard deviations is +6.0 mm. at 31 degrees.

The range of 1 standard deviation from the mean is an objective in the author's practice. That yields a total range of 5.0 mm., which permits a sensible positioning of this tooth. In general, the lower incisor should be aligned near or slightly anterior to the APo plane by the time the patient reaches adulthood.

This measurement, likewise, was broken down by age groups (Chart 2). It had been my clinical impression that the lower incisor seemed to maintain a consistent relationship to the APo plane, once it erupted into the mouth. In other words, as convexity decreased with growth, the lower incisors became more upright and retracted slightly. This was borne out by the findings. The lower incisor erupted at +0.4 mm. and thence to +0.7, and settled at nearly 0.0 to the APo plane on the average.

It should again be mentioned that this is cross-sectional material handled in a longitudinal manner and, as such, is inconclusive but gives leads to serial studies.

Upper incisor to APo plane: The upper incisor was measured by a technique identical to that used by Downs,[5] or to the A pogonion plane, yielding

a mean of 5.7 mm. (Fig. 2, *4* and Figs. 8 and 13). The upper incisor range was found to be from –8 to +15 mm. One standard deviation was 3 mm. The relationship of the upper incisor to the facial plane can be determined by adding the distance of the upper incisor to the APo plane to the distance of the APo plane itself to the facial plane at the level of the occlusal plane, or otherwise the upper incisor directly to the facial plane.

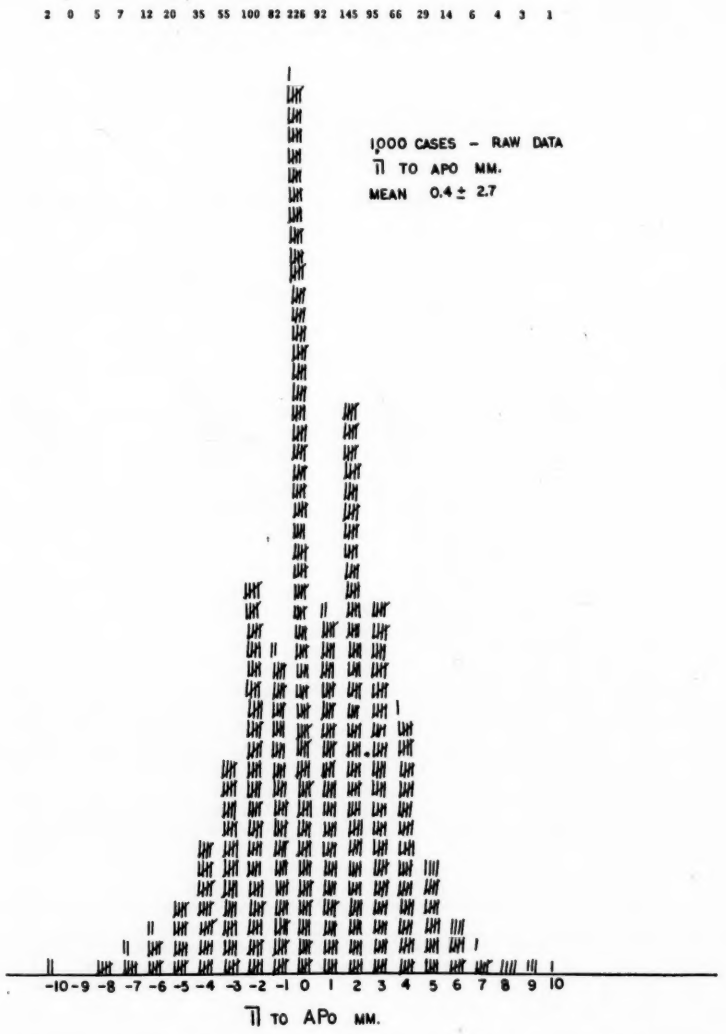

Fig. 11.—Spatial distribution of the lower incisor to the APo plane, in millimeters, in 1,000 clinical cases. Measured from the incisal tip. Note that 226 cases were within 0.5 mm. of the APo plane. This high center or kurtosis suggests a small range for the majority of the sample.

Facial Esthetics and Lip Abnormality—Esthetic Plane.—Much disagreement has existed in regard to esthetics, due partly to the lack of a method to communicate and describe the conditions that exist. With this in mind, I selected a line from the tip of the nose to the end of the chin as a reference (Fig.

2, *d-e*). This was termed the esthetic plane. The lips are related to this line simply for purposes of description and classification.

In 1,000 cases before treatment the lower lip, on the average, was found to be 0.3 mm. ahead of this line. The standard deviation was 3.0 mm.

The upper lip, on the average, was found to be about 1.0 mm. posterior to the lower lip when related to the E plane. The mean was –0.7 mm. in the first 800 cases.

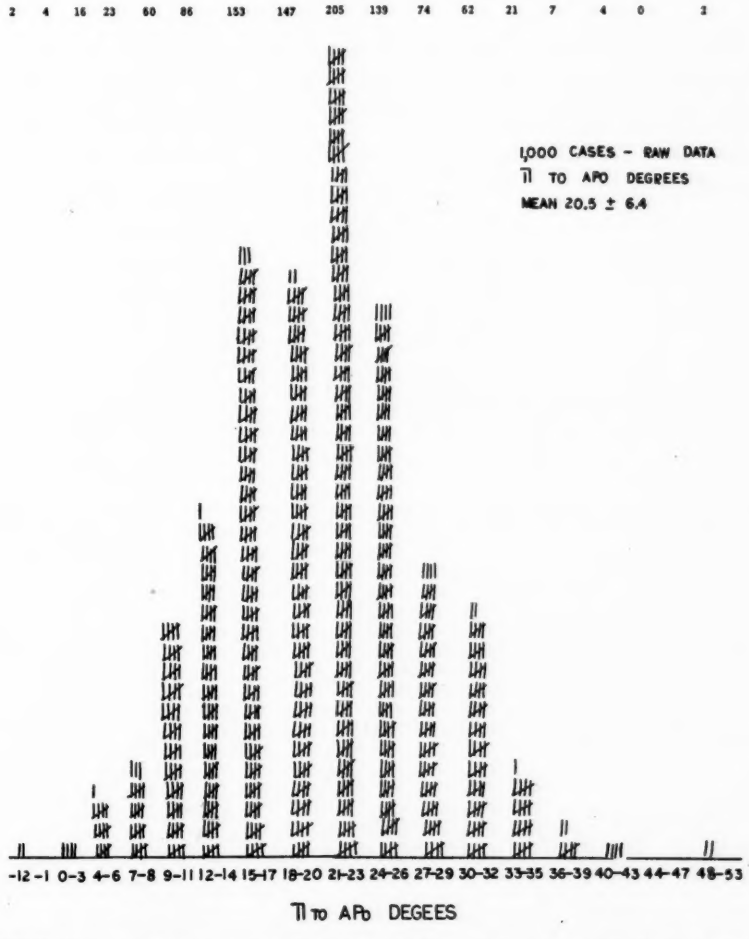

Fig. 12.—Distribution of cases measured in angulation of the lower incisor to the APo plane. Note that the greatest frequencies were found between 21 and 23 degrees.

In this sample a very interesting finding resulted from the breakdown in age groups. In the deciduous dentition the lower lip mean was almost 1.0 mm. ahead of the E plane. In the older age groups this reading progressively decreased. The breakdown is shown in Chart 2.

The striking finding is that the average case in the 11- to 14-year age group varied 0 mm. (lower lip on the E plane). The adult age group, however, showed a difference of a full –4 mm. (Chart 2). It should be emphasized that this is a cross-sectional study and that longitudinal research is necessary to

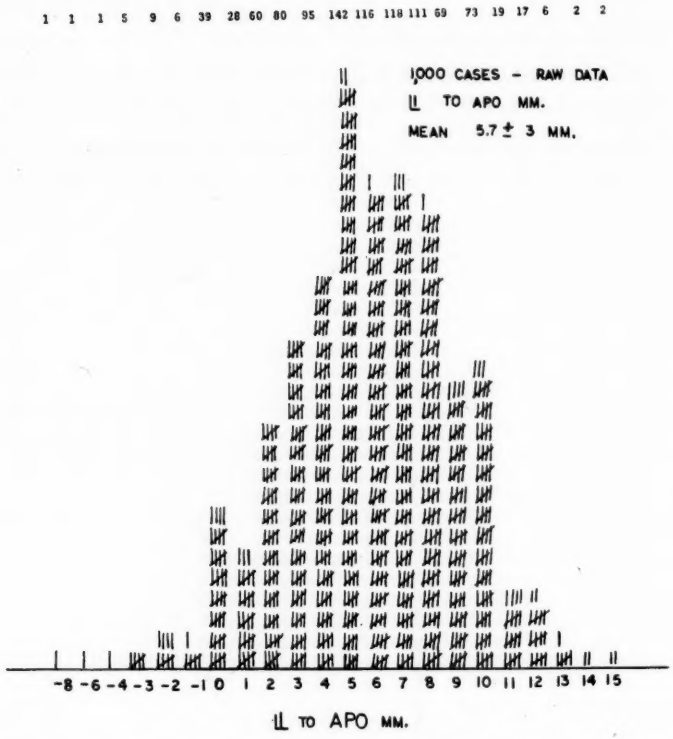

Fig. 13.—Histogram of the upper incisor relationship to the APo plane in 1,000 clinical cases. (See Fig. 8 for some extreme cases.) Measured from the incisal edge to the APo plane.

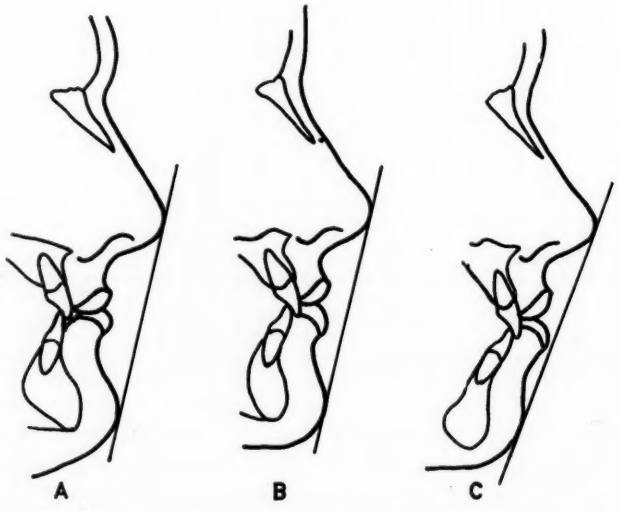

Fig. 14.—Normal variation in lip relationship in three cases of superb occlusion. *A*, A 37-year-old man with moderately concave face. The lower incisor is 2 mm. posterior to the APo plane. Note distance of lower lip to E line. *B*, A 26-year-old woman with a straight face. The lower incisor is 1 mm. forward of the APo plane. *C*, A 14-year-old girl. The lower incisor is 3 mm. anterior to the APo plane. This variation makes it difficult to establish exact rules of lip relationship. Note, however, that in no case do the lips protrude beyond the nose and chin line. Note further that the contours of the chin and lips are smooth.

validate this finding. One item of explanation might be growth of the chin, but primarily growth of the nose together with contractions of the lips in later life probably accounts for the esthetic change. Fig. 14 shows lip variations in three different types of patients with perfect occlusion.

Certain functional abnormalities of the lips (Fig. 15) have been classified[14] and warrant a detailed discussion. The esthetic plane serves as a useful aid in helping to identify these conditions. Thus, five functional abnormalities of the lips can be recognized on the headfilm, as follows:

I. *Lip atrophy or inherent shortness of the lips (Fig. 15, I).* This condition in the upper lip is sometimes combined with tongue-thrusting and open-bite. The lip is not strong enough to oppose a thrusting tongue, and the break between the lips usually falls well above the plane of occlusion. When patients with this condition smile, they display a large amount of gingival tissue. Short lower lips should also be recognized. What appear to be short lips may also be noted in cases of prolonged thumb- or finger-sucking.

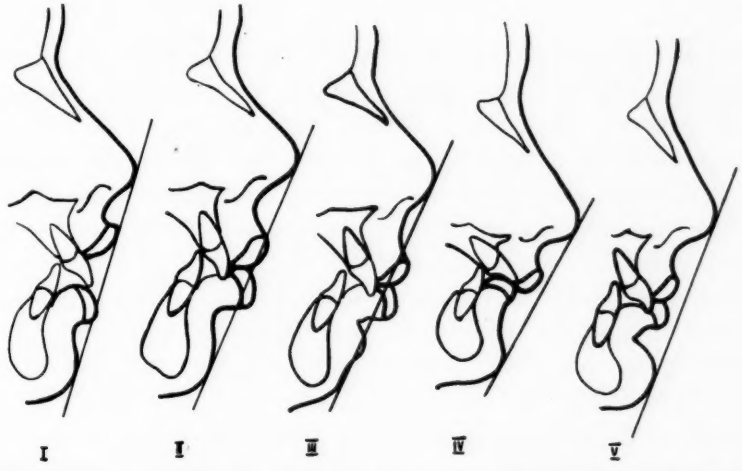

Fig. 15.—Five Class II, Division 1 cases showing five abnormal lip relationships: *I*, Lip atrophy or inherent shortness; *II*, lip strain, with pursing of mouth to obtain closure; *III*, mentalis habit, severe manifestation of lip strain; *IV*, lip-sucking; and *V*, sublabial contraction (note crease or depression below the lips).

Note in all cases that the contours are irregular. Note in *I*, *II*, and *III*, that the lips protrude beyond the E plane. Note the forward position of the upper lip to the lower lip in *IV* and *V*.

II. *Lip strain, the result of stretching the integument of the soft tissues over a protrusive denture (Fig. 15, II).* This results in a furrowing at the caninus muscle and wrinkles in the cheek. Sometimes this is not esthetically objectionable, since it is transitory on swallowing, but it is not normal. Lips in these cases are usually normal in structure but simply undergo strain when the mouth is closed.

III. *Mentalis habit.* Chronic mentalis habits are usually a compensation for either *protruding teeth* or *severely long faces.* In either case, the

chin is elevated in an attempt to gain lip closure (Fig. 15, III). A "balling-up" of tissue in the area just anterior to the roots of the lower incisors is usually the diagnostic sign. It is a severe manifestation of lip strain.

IV. *Lip-sucking or lip-biting (Fig. 15, IV).* This condition is almost always found on the lower lip, which is sucked under the upper teeth. It is usually either a habit in itself or a part of the swallowing reflex. The position of the lip completely beneath the upper incisor is usually the diagnostic sign.

V. *Sublabial contraction (Fig. 15, V).* This condition is identified as a furrow below the lower lip resulting from a gripping action of the orbicularis oris and buccinator complex. Continuous activity with these muscles yields a retraction of the lower incisors, a crowding of the lower anterior teeth, and the appearance of a "button" on the chin. A retrusion of the upper teeth and the severely deep bite often are characteristic of this type of lip tension (Class II, Division 2 commonly). Diagnosis of this condition is facilitated by recognizing an ischemic dermatitis in the furrow below the lower lip in severe cases with maxillary incisor protrusion.

Craniofacial Analysis or Deep Structural Considerations.—The orthodontic survey represents, for the most part, problems in the profile. However, *other parts are of concern when more detailed information is desired* in order to explain the conditions recognized in the profile. Thus, the consideration of individual parts adds analysis to the survey. These areas can be divided into three aspects—(1) cranial base, (2) temporomandibular, and (3) nasopharyngeal components.

Only 200 cases were selected as a sample for the study of these basic components. The *angulation* of the cranial base was measured by the angle N-S-Ba. The mean was 129.6 degrees, and the range was 114 to 144 degrees (Fig. 16). Björk,[15] Brodie,[16] and I[17] had previously measured this angulation, with very little difference in our findings. The bend of the cranial base seemed to bear an important influence of the maxilla to cervical vertebrae, although other factors were of significance. Thus, obtuse and acute cranial base angles were critical to the adequate understanding of midsagittal skeletal relationship. Björk has repeatedly shown this to be true, particularly of craniotemporal relationships.

The angle SGnN was taken to represent proportionate length of the anterior cranial base. The average was 35 degrees. Short anterior cranial bases as measured by this angle were observed to be as low as 25 degrees; long cranial bases ranged to 42 degrees. Again, these are only proportions and do not permit direct-length comparisons, and they change with growth by getting smaller as the mandible grows. Fig. 17 shows impressions gained by this method of comparison.

Certain temporomandibular components were employed for purposes of analysis. An indicator of condyle and/or fossae position was employed in the

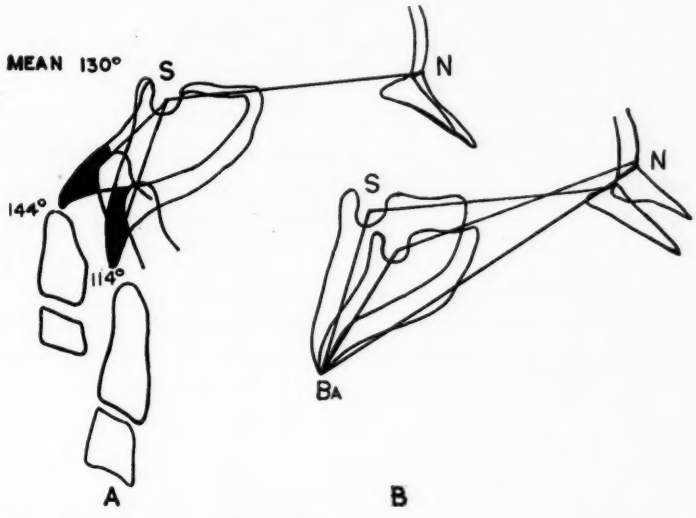

Fig. 16.—Cranial base variation in 200 cases.

A, N-S superimposed and registered at S, with a low of 114 degrees and a high of 144 degrees. Note that the condyle position and cervical vertebrae are also variable, together with the cranial base, in these two particular cases. *B*, Superimposed on basion-nasion and registered on Ba. Note the extreme variation in SN angulation from this posterior to anterior cranial fossal reference.

Consideration of this area helps to explain relationships of other structures. For instance, the case with a 144 degree or obtuse cranial base angle also displayed a severe Class II, Division 1 malocclusion and severe convexity. Note in *B* how SN would be tipped upward and outward if no other factors were of concern. The case with an acute cranial base of 114 degrees exhibited a Class I occlusion with moderately prognathic chin and slight facial concavity.

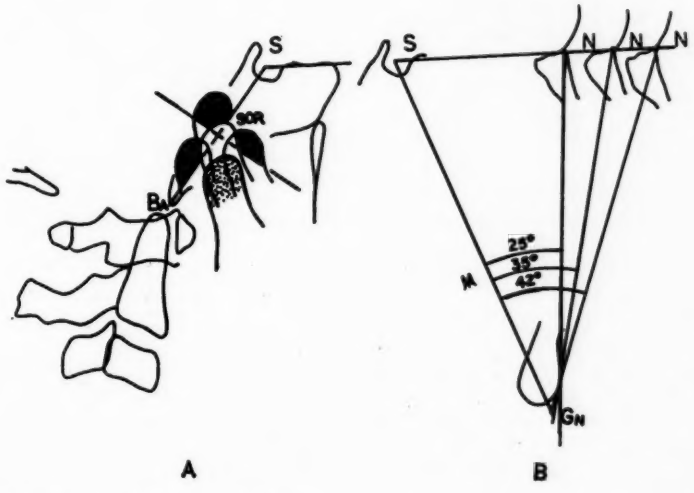

Fig. 17.—Other factors in cranial base.

A, Variation in condyle position relative to spheno-occipital reference point. SOR is found by bisecting distance from S to Ba and dropping perpendicular. Top center point on the condyle is measured. S is 12 o'clock and Ba is 6 o'clock. For purposes of communication of condyle position, the top outline would be 9 mm. at about 10 o'clock, the backward figure would be 7 mm. at 8 o'clock, the upward and forward figure would be about 1 o'clock at 6 mm., and the lower forward (stippled) figure would be about 4 o'clock at 5 mm. Thus, condyle position to the cranial base, in addition to the variation of the cranial base itself (Fig. 16), is important.

B, Length of the SN plane. Variation in the angle S-GN-N is taken to suggest relative length of anterior cranial reference plane. The same chin would thus yield different facial angles, depending upon the position of N. A very low standard deviation was noted, with a mean of 35, a low of 25, and a high of 42 degrees.

following manner. The SBa plane was bisected, and this point was called SOR (spheno-occipital reference) (Figs. 2 and 17). The center of the most upward and backward point on the condyle head was measured to that point. In order to simplify this interpretation, let us call the SOR point the center of a clock, with point sella falling at 12 o'clock. A condyle located at 10 o'clock at 5 mm. would be located upward and backward from SOR about 5 mm. A condyle located at 8 o'clock at 2 mm. would be found 2 mm. backward and downward from SOR.

The findings in the 200 cases revealed that the average case was located 1.3 mm. upward and 1.9 mm. backward from point SOR. The condyle location appeared to be a dramatic consideration in isolated cases. Some cases demonstrated "dual" or "triple" bites (Fig. 18).

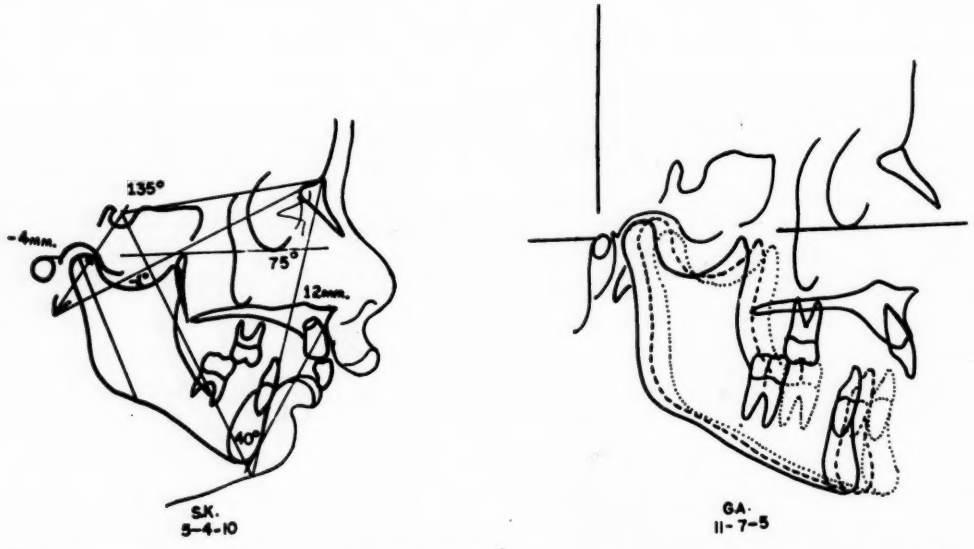

Fig. 18.—Factors in diagnosis of mandibular position and relation to other cranial and facial elements.

Patient S. K. has a most severe type of Class II, Division 1 occlusion which can be explained as follows: There is a severe retrognathism (75 degrees facial angle) with slightly greater height than depth to the chin (XY axis, −1 degree). The contour is severely convex (12 mm. A to facial plane). The cranial base is slightly obtuse (135 degrees = 5 degrees more open than the mean). The condyle is located at 9 o'clock at 4 mm. and still does not appear to be seated in the fossa. The SN line is long (S-GN-N = 40 degrees). This case thus might be due to a large anterior cranial fossa, obtuse cranial base, and a glenoid fosa that is high and backward to related cranial structures, together with a slightly protruding maxilla.

Patient G. A. has a triple bite, illustrating factors in mandibular posture for diagnosis with the head x-ray. The dotted line shows the patient in Class I (just slightly ahead of physiologic rest), but still manifesting overjet. The hashed line shows a full Class II occlusion (condyle was centered). The solid line shows a relationship one full cusp distal to a Class II occlusion observed when the patient was instructed to "pull the lower jaw back and close."

A working condyle axis was erected by inspection as nearly as possible from a point in the center of the condyle head and a point bisecting the condyle neck (Fig. 2). This usually crossed the border of the mandible near the antegonial depression. As I demonstrated in an earlier publication,[17] this line tended to be the growth axis of the mandibular condyle, although a better line is still sought.

This line yielded the inclination of the condyle head to such cranial landmarks as the basion-nasion plane. Measured in a manner similar to the Y

axis, it also varied around a 90 degree angle. The average in 200 clinical cases was −5.7 degrees, and the range was −19 to +20 degrees. Two severe cases with unusually different mandibular patterns are illustrated in Fig. 19. Combined with the survey, the mandibular pattern offers an explanation for the highly variable faces.

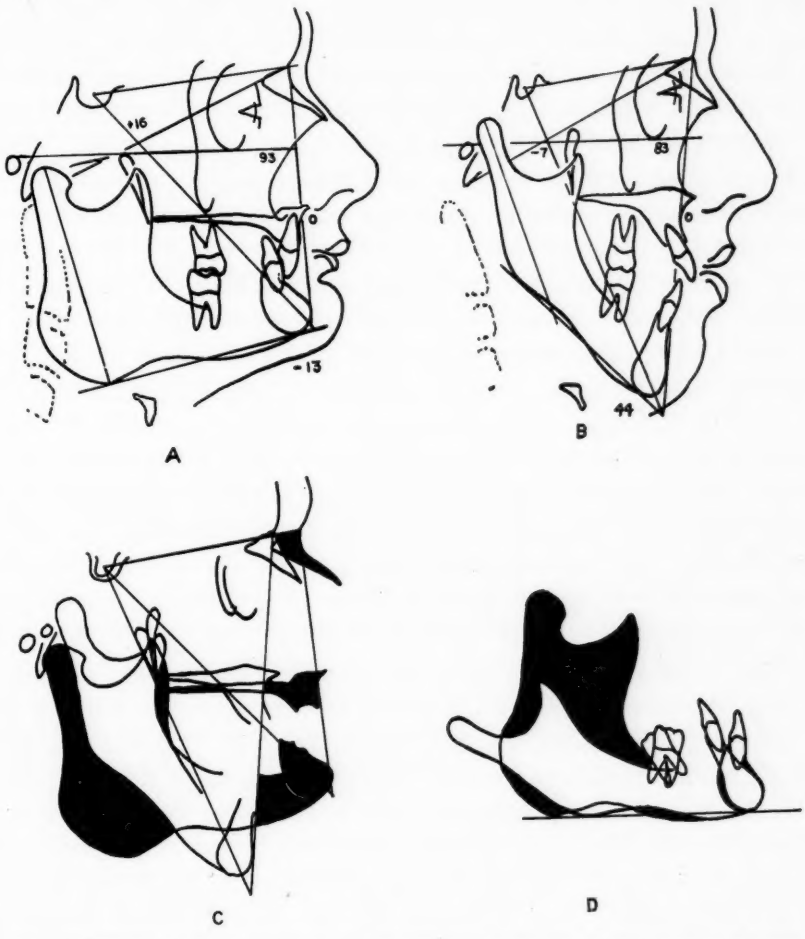

Fig. 19.—Tracings of two extreme cases compared to show the effects of the mandible in facial morphology.

A, Lateral tracing of a short, deep type of face with complete overbite. Note that the XY axis is +16. Note the large, overdeveloped angle consistent with close-bite.

B, The opposite type, an open-bite with a long, shallow face (XY axis, −7 degrees). The angle almost failed to develop in this case.

C, Comparison of cases on the SN plane reveals the vast difference in the facial height and facial depth. Note how the facial angle, together with the XY axis, described these differences.

D, Note the almost unbelievable difference in these two human mandibles as they are superimposed on the symphysis and lower mandibular borders.

In certain cases information regarding the dimensions of the nasopharynx is required. I have also discussed this method in other publications.[16]

The measurements of cranial components thus supplemented the survey for a more ample interpretation of critical areas important to some specific cases, but they were not used routinely.

DISCUSSION

This material was selected because of the frustration brought on by many samples, or by a lack of samples, in the past. An orthodontist does not treat the normal. His problems are with the abnormal. Certain investigators have arrived at optimal or ideal standards based on a conception of normal, while others have gathered a small normal sample in an effort to describe normal requirements. These efforts have been worth while. However, this sample is aimed at revealing a range for description and comparison of orthodontic problems as they daily confront the practitioner. Often problems treated at best will not warrant description as normal.

The method has evolved through what was thought to be critical and informative with constant clinical use. We started with Downs' analysis and modified it for our own purpose. It represents what we have found most informative and meaningful to us. It supports both the Downs[5] and the Steiner[20] analyses, but it is approached with different objectives.

The selection of Frankfort horizontal by inspection of the "ear hole" seemed sensible from the observations of previous laminagraphic studies of the joint area. The Frankfort horizontal plane is almost parallel to the earth's surface and seemed to serve as a valuable yardstick for the horizontal posture of the head. It has been shown to have variation in the normal population (standard deviation, 5 degrees), but it is used here specifically as a plane of reference for interpretation of facial depth (Fig. 19). Also, the Frankfort horizontal plane can be appraised subjectively by viewing the patient in the chair, whereas other craniofacial references cannot be viewed externally.

The Facial Angle.—Downs' normal cases exhibited slightly larger facial angles (mean, 87.7 degrees) than this orthodontic sample. This facial angle mean of 85.4 degrees with a standard deviation of 4 degrees suggested that about two-thirds of all the cases ranged between 81 and 89 degrees. We know, however, that the facial angle increases with growth, and Downs' average in the sample was older by about four or five years. Also, our porion point, selected by inspection, was higher and yielded larger angles than Broadbent's method of using the ear post. Even allowing for the differences in technique one-third to one-half of the cases observed probably have no essential problem in depth of the lower face. That still leaves a full one-third to one-half in the range of inadequate mandibular position or mandibular length by comparison to the normal.

For the purpose of communication, it seemed practical to classify patients, as suggested by Downs,[5] into retrognathic, mesognathic, or prognathic categories. Classifying 1 standard deviation from the mean as a mesognathic group would suggest that cases with facial angles of less than 81 degrees are definitely within the retrognathic range (Fig. 18). Cases measured beyond 89 degrees would fall into the prognathic range in terms of the position of the chin in relation to cranial references. Round figures of 80-85-90 define these limits nicely. However, the facial angle is more descriptive when augmented by the Y axis, as will be presently discussed.

When employed in this manner, the facial angle simply indicates the location of the chin and suggests the depth of the lower face. As far as I am concerned, this is the only real use for which the facial angle can be applied.

It should again be emphasized that angles selected as indicators of height and depth of the face represent proportionate comparisons. They suggest height in relation to depth on the basis of the form of the individual and not a comparison of the facial sizes of two individuals.

XY Axis Classification.—On the basis of the XY axis angle, faces were classified as long, medium, or short in height relative to depth. Faces more than +8 or 9 degrees to the basion-nasion plane were usually short faces with close-bite tendencies. Cases in which the angle was less than 90 degrees, or on the minus side, usually exhibited open-bite or retrognathic tendencies (Fig. 19).

The combination of the facial angle with the XY axis usually obviated the need for a measurement of the mandibular plane angle. It is important to differentiate close-bite faces with close-bites and open-bite faces with open-bites in planning and prognosing treatment. The procedure outlined provides that differentiation (Fig. 19).

Facial Convexity.—Almost straight faces were characteristic of normal cases in Downs' study. His average was exactly straight, with extremes at 4 to 5 mm. In our sample, however, some cases demonstrate convexity well over 1 cm. These cases thus present jaw orthopedic problems as well as malocclusions.[19] A sensible correction of convexity is thus desirable, if possible, in such cases (Figs. 7 and 18).

The average case in this sample was 4 mm. convex in the skeletal profile, although the mode fell at 5 mm. It is up to the clinician to decide for himself the degree of acceptable convexity for a case. Many orthodontists regard any convexity as a problem, whereas others hold convexity as a facial type. However, *not all facial convexity should be condemned.* Patients with a short anterior cranial fossa or backward divergent foreheads, might display convexity due to a backward position of nasion. In other cases, both point A and the chin may be prognathic. These represent bimaxillary basal prognathism with straight jaws related to a true vertical, and yet the profile is convex. Some classically beautiful faces retain this characteristic. These also were discussed by Downs.[5]

Thus, to the orthodontist the real significance of convexity is that some Class II, Division 1 cases are characterized by severe basal bone disharmony and require either *orthopedic* correction or the alignment of the teeth to the facial curve. Other equally severe cases, as viewed from the dental casts, might be due to teeth tipped or drifted on the basal bone when viewed from the headplate. It is therefore important to determine whether basal bone or alveolar bone is the major concern in the diagnosis. To some degree, this can be done by gross inspection of the film, but errors in judgment are avoided by routinely measuring the headplate.

Analysis.—Certain features in the cranial base were analyzed as a basis for determining etiology in certain cases. The relationship of facial elements

can often be explained by abnormally long anterior fossae or extremely unusual positions of the glenoid fossa, that is, condyle location to the cranium.

Obtuse cranial base angles are often consistent with deep nasopharygeal dimensions and maxillae that are forward. Acute cranial base angles are often consistent with narrow nasopharyngeal dimensions. I have shown[21] that the nasopharyngeal area and function are influential in tongue posture: hence, the nasal area is of importance in diagnosis.

Björk and Lindegard[22] have published work on the variation in condyle location relative to cranial landmarks. Wylie[23] also was concerned with condyle location in his analysis. I[24] studied the condyle-fossae relationship in rest and closed position before and after treatment. In this present sample, from a morphologic viewpoint, the variation in fossae position to cranial reference was much greater than expected. The average condyle seemed to be well centered near the outline of the spheno-occipital suture. Some cases presented condyles that were far upward, backward, downward, or forward. These seemed to influence the relationships of the mandible and were important aspects in the variation of facial morphology (Figs. 17 and 19).

Discussion of Point A, Point B, and Pogonion.—Point A is modified as the teeth erupt and has been shown to change greatly as the teeth are moved. Nevertheless, it is still possibly the best indicator of the most anterior part of the basal bone of the maxilla that can be selected. Anterior nasal spine and alveolar bone are definitely processes from the basal bone.

Point B has been shown to be an alvolar point. It entirely disappears in many full prosthetic cases. Without exception, a change in the root relationship of the lower incisor is followed by an alteration in the alveolar contour around point B, especially during eruption. Therefore, point B will be determined automatically by describing the position and the inclination of the lower incisor.

Until proved otherwise, my impression gained from tracings of serial x-rays suggests that, for the most part, a "button" on the chin develops as a result of change in the lower alveolar bone and not so much because of external apposition of bone at the symphysis. The two phenomena are undoubtedly combined in many cases, however.

Pogonion should be located on the mental protuberance at the symphysis of the chin[25] and should not be confused with the mental tubercles which are lateral to the midline. The tubercles sometimes show apposition of bone following maturation of the mandible, especially in males. We look to metallic implantation techniques for information in this detail.[26]

Discussion of Position and Location of the Denture.—Since the lower incisor is a critical concern to the clinical orthodontist, a certain amount of discussion of its relationship seems justified.

The average lower incisor in this sample and Downs' normal were almost exactly the same in relation to the APo plane (+0.5 mm.). One standard deviation in this large sample represented the entire range in Downs' normal (Fig. 10). In other words, most malocclusions seemed to display a lower incisor

that was located normally in relation to the APo plane. It would appear, therefore, that in many malocclusions the real factor at fault is relationship of the whole jaw, that is, discrepancy in facial contour.

Two other recent investigations bear importance to this discussion. Shudy,[28] studying fifty cases selected on the basis of superb occlusion and beautiful faces in the Indiana University sample, found that the average lower incisor was 1.6 mm. ahead of the APo plane. In another sample of 400 random malocclusions, Shudy found the lower incisor to be 1.7 S.D. 2.16 mm. in front of the APo plane.

Hopkins[29] reported on forty girl and boy winners of Los Angeles junior high school "Smile of the Year" contests. He found that the lower incisor was 2.25 S.D. 1.7 mm. anterior to the APo plane. However, these children were selected because of their attractive smiles, which perhaps explains the slight prominence or forward position of the teeth.

Generally speaking, in cases with profile convexity the incisor tip is often located forward of pogonion (Figs. 7 and 8). In cases with profile concavity the incisor tip is usually located posteriorly, but the inclination of the lower incisor is not necessarily consistent with its position. Teeth can be tipped forward and still be positioned backward, and vice versa. Obvious oral habits account for many cases in which the lower incisor is outside the normal range in angulation and position.

Serial growth investigation in a limited number of cases has suggested that in most cases of normal growth the lower incisor maintains a rather consistent relationship with the APo plane in the absence of oral habits. This cross-sectional study seemed to confirm that finding. However, the inclination of the APo plane itself may change with growth and treatment.[27] As the mandible grows, pogonion moves forward. During treatment point A can be moved, usually backward. Both these factors upright the APo plane or the denture plane.

Thus, in cases with severe convexity, even though the lower incisor is normal in relation to the point A-pogonion plane in the beginning, the lower incisor might need to be uprighted due to the straightening of the profile. Cases exhibiting a lower incisor too far posterior to the denture plane can be corrected by either a backward retraction of point A over the incisor or a forward movement of the incisor. Either will produce the same change in this relationship.

The above factors are interpretations for treatment planning and are no longer analysis. The survey or the analysis only describes conditions as they exist. Planning treatment is another subject which includes many factors other than those included here.

Pointing out the diagnostic factors helps to understand the frustration reflected in the literature with regard to methods of evaluation of the lower incisor. In my opinion, the *point A-pogonion plane still serves as the most intelligent and sensible point of reference for the lower incisor before, during, and after treatment.* On the basis of this and other studies, there is a function for the APo plane reference to apply in all types of faces at all ages.

Application of this type of genuine thinking to the publication by Lindquist[2] on the subject of the lower incisor will, I think, clear away some of the confusion of different methods that he discussed.

SUMMARY

I felt a need for a restatement of the objectives of so-called cephalometric analysis. The semantics of terms were discussed to familiarize the reader with survey, analysis, and synthesis as applied in this study.

One thousand cases were studied in an effort to establish a knowledge of the most common orthodontic problems and the variation of more infrequently occurring problems.

A system of five measurements from x-ray tracings was designed to provide a sensible method of informing the orthodontist of facial form and denture position. The five measurements were (1) the facial angle, (2) the XY axis angle, (3) the measure of contour, and (4 and 5) the relationship of the upper and lower incisors to the APo plane.

These angles and measurements proved to be indicators of facial depth, facial height, and profile contour. Classification by assigning numerical limits of the denominators for chin location made for an easier and more informative communication of problems. Thus, the cephalometric x-ray was shown to provide a description, a comparison, a classification, and a communication of existing conditions. Certain classifications were thus proposed for future semantic purposes.

The teeth were measured from the denture bases rather than to points outside the dental areas. The position of the lower incisor in relation to the APo plane was thought to be the key to communication of the problems with the anterior teeth. Thus, a line from point A to pogonion was described as the denture plane.

Age changes in position of the lower incisor, facial contour, and lip relations were studied from a cross-sectional viewpoint. The average convexity decreased consistently from the deciduous dentition age to the full adult dentition age. At the same time, the lips became progressively more retracted in relation to the esthetic plane. However, the relationship of the lower incisor to the APo plane tended to be similar in the age samples studied.

A system for deep structural analysis was proposed for those cases in which more detailed information is desired. This included the length and angulation of the cranial base, the location of the glenoid fossa and the condyle head, the angulation of the condyle neck to the cranial base, and the mandibular plane angle. The analysis of the nasopharynx was also employed in cases with cleft palate, speech, or breathing problems or other problems near the coronal suture complex area.

I stressed the need for the concept that a survey or analysis was for the purpose of describing and understanding skeletal proportion and form. Treatment planning constitutes a separate subject embodying the factors of growth, tooth movement, and changes in function. That subject—cephalometric synthesis—should be dealt with separately.

CONCLUSIONS

1. The quantitative evaluation of the cephalometric x-ray is only one part of the whole clinical application of the cephalometric technique. The primary purpose of tracing and measuring is to permit a critical description rather than a description in terms of "good" or "bad" or a "lot" or a "little."

2. For routine clinical use, a cephalometric procedure should be brief and critical. The consideration of three planes of reference—the facial plane, the point A-pogonion plane, and the esthetic plane—was found to be beneficial. These planes helped to evaluate the profile in terms of skeletal size, facial form, denture position, and soft-tissue relations.

3. Abnormal lip function can be classified cephalometrically when the film is taken with the teeth clenched and the mouth closed.

4. The headplate can reveal a malocclusion which presents an orthopedic problem or indicate that a case is strictly dental or local in nature. Facial convexity or concavity of more than 5 mm. was usually considered to be on the border line of an orthopedic problem of jaw relationship.

5. An explanation of conditions of the profile can be looked for and found within the basicranial, temporal, and mandibular elements. Proper consideration of these structure will often reveal a morphologic etiology.

6. The survey or analysis is not a formula for treatment but a method of describing conditions. Treatment planning should take into consideration such factors as growth, anchorage values of teeth, cooperation of the patient, and a sensible interpretation of the objectives of treatment for the particular patient. All these factors must be predicted by the orthodontist and are a separate subject.

GLOSSARY OF TERMS

Points

EEC =	Top of external ear canal by inspection (dark circle in radiograph). (Might be also P or porion.)
O =	Orbitale—lower border of the eye socket.
N =	Nasion—front end of suture between the frontal and nasal bones (nasal depression when suture is invisible).
Po, Pog, or P =	Pogonion—most anterior point on the mental protuberance.
Ba =	Basion—anterior border of foramen magnum—tip of basilar portion of occipital bone.
S =	Center of sella turcica by inspection.
GN or Pgn =	Gnathion or prognathion—most downward and forward point on the symphysis crossing of Y axis. We have used the intersection of facial and mandibular planes to select this point. (Not to be confused with menton, which is the lowest point on the symphysis but sometimes called gnathion.)
A =	Deepest point on the curve of the bone between the anterior nasal spine and dental alveolus; also termed SS or subspinale (below the spine).
SOR =	Spheno-occipital reference, selected by a perpendicular through center of line from basion to sella.
$\overline{\lvert 1}$ =	Tip of incisal edge of anteriormost lower incisor.

$\underline{\lvert 1}$ =	Tip of incisal edge of anteriormost upper incisor.
$\frac{\underline{\lvert 1}}{\lvert 1}$ =	Interincisal angle or upper incisor angle to the lower incisor.
d =	Most anterior point on soft tissue of chin (about where a chin dimple would be).
M =	Mandibular notch—deepest point on curve in antegonial area.
e =	Most anterior point on the end of the nose.
Lip =	Most anterior point of the lower lip.
EEC-O (Sometimes PO) =	Cephalometric horizontal plane (Frankfort).
NPo =	Facial plane.
SGN =	Y axis
BAS =	Basion-sella plane.
BaN =	Basion-nasion plane (basicranial axis of Huxley).
APo =	Point A-pogonion plane (dental plane).
$\overline{\lvert 1}$ axis =	Line through axis of lower incisor (center of apex to the incisor tip). Same for upper incisor.
de =	Esthetic plane or E line.
Condyle axis =	Line drawn down long axis of the condyle head by inspection. Usually intersects lower border of the mandible at M.

Angles

Facial angle =	Intersection of horizontal and facial planes
XY axis =	Intersection of Y axis with basion-nasion.
$\overline{\lvert 1}$-APo =	Lower incisor to APo plane.

Linear Measures

A to facial plane =	Distance of point A to the facial plane (contour).
$\overline{\lvert 1}$ to APo =	Tip of lower incisor forward or backward (plus or minus) of the point A-pogonion plane.
$\underline{\lvert 1}$ to APo =	Same for upper incisor tip.
Lip to E =	Lower lip to the esthetic plane (plus or minus similar to APo plane).

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875 VIA DE LA PAZ.

EMOTIONAL PROBLEMS OF CHILDREN AS THEY RELATE TO ORTHODONTICS

SEYMOUR L. LUSTMAN, PH.D., M.D.,* NEW HAVEN, CONN.

RATHER than go into psychological theories concerning the importance of the mouth in personality, I shall discuss other things which are of primary concern to the psychiatrist but which I think have a great deal of reference to the work of the orthodontist. These problems have to do with the way patients react to us, the way we react to patients, the preparation of patients for whatever procedures we are going to do, and ways of enlisting and maintaining the very genuine cooperation of the patient. Because of the length of orthodontic procedures, treatment can fail at any one of these levels by virtue of the fact that the child particularly presents difficulties.

Perhaps I can give you an example of what I mean by describing an experience that I had in New York City. A friend of mine who is a pediatrician had met my train, and we were leisurely driving across town when we came to a stop street. There was a policeman standing in clear sight right by the sign. The pediatrician shifted into second and deliberately drove across the street. The officer stopped us in great anger, and my friend said to him: "Officer, I am a doctor and every moment that you hold me up here, you are endangering the life of a child." He was so vehement about this that the policeman was taken aback, became apologetic, and told us to continue right ahead. As we drove on, my friend turned to me and said: "I don't know why, but I just love to put something over on those guys."

One begins to wonder what is it that makes an adult man—a rational, responsible person—behave in this way. The motivations which underlie this type of behavior have a lot to do with the problems that confront us. It becomes a little easier to understand if you know something about my pediatrician friend. He was born into a very rigid, authoritarian home. The father had the boy's activities planned, not only on a daily level but on a year-to-year basis with a life plan all mapped out. As a boy my friend was permitted a minimal amount of independence of decision and action, and this characteristic behavior of "putting something over" was something of which we were all very much aware when we knew him as a medical student. He was the student who never quite understood the assignment, who always got it in a little bit late, who devoted all his energy to figuring out the angles, and who literally went through

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*Associate Professor of Psychiatry, Child Study Center, College of Medicine, Yale University.

school putting it over on his teachers. Actually, we are dealing with a lifelong pattern of someone who, very deep inside himself, feels when he comes into a position where somebody is in authority in relation to him that he must get around this by putting something over on that person and cheating him in some way.

Let us now consider for a moment the task of anyone in the health field, be he a physician or a dentist. (Actually, this also applies to lawyers and others, but it is particularly true of those who deal with patients.) Literally nothing that a person faces makes him feel a greater pull to regression (by that I mean a greater pull to feeling helpless) than placing himself in the hands of an expert—someone who is bigger than he is, who knows more than he does, and who is going to take care of him. We must remember that the situation of being a patient evokes all the attitudes of the past in which a person has had to deal with his own helplessness and with the authority of someone else.

What this will evoke differs from person to person. All of us, however, have had some uniformity of experience in that we were all born relatively helpless and had to depend exclusively on one or more adults to take care of us, to nourish us, to guide us, and to see that we survived. It is inevitable that during this period of dependence certain things which are very individual for each child and each parent will occur and will make a lasting imprint on the personality of the child and the adult that he subsequently becomes.

We all know the kind of patient who comes into the office, relaxes into a little heap, and says in effect: "Take care of me, you wonderful doctor." We also know the converse of this patient for whom one can never do enough, who is always irritated, irritable, angry, and, like my friend, tries to put one over on you. What I am trying to say, then, is that everyone, having been reared in a family and having developed very deeply ingrained attitudes toward authority and toward being helped, will manifest these attitudes without any real awareness of what he is doing.

Thus, the dentist must deal with a tremendous number of attitudes, of lifelong duration and quite basic to personality, which the patient brings into the office along with his dental problems. As the professional person in the relationship, the dentist is not only in the position of authority but is in the position of authority in a very particular situation in which the patient is relatively helpless and has to depend on the dentist's judgment, skill, and interest.

This means that the dentist falls heir to a tremendous number of attitudes and actions which have little to do with the procedures that he performs but which may have a lot to do with the ultimate outcome. This is especially true in orthodontics. With some of our patients we get a legacy of anger and animosity which we know we do not deserve. With others we get a legacy of affection, trust, and appreciation far beyond that warranted by what we have done for the patients.

The latter situation is ideal for the orthodontist, for he can use the patient's good feeling to further the therapeutic goals. The former, however, presents very real problems in terms of the patient's cooperation during lengthy treatment. It is important to remain aware of what transpires between ourselves and our

patients, so that as these attitudes become expressed we do not take them in a personal way and respond in kind. I am not speaking of the patient who is angry for a real reason of which we are very much aware. I refer to the more subtle instance in which we are puzzled about why the patient is acting in a certain way and in which we feel provoked. If we misunderstand and feel that this is a personal attack, the tendency is to respond in kind—to throw the patient out of the office, to refer him elsewhere, to charge him more, or perhaps to make a procedure a little more painful than it has to be, all of which comes from a very personal reaction. If the orthodontist remains aware of the fact that the patient has brought his personality as well as his teeth to the office, it becomes a little easier to minimize personal involvement and to stick with the reality of the situation.

Let us now consider the counterpart of the patient's attitude. We, too, are human and have gone through the same kinds of processes, and we have the same very real tendencies to react in terms of our own experiences and needs. If a patient spits a solution upon the floor, you may stop him and wonder why he does such a gross, unusual thing as if he wants to make you angry or get even with you for something. This is not much of a problem, really. However, if a more subtle patient talks to you while you are working and tells you about how the Catholics, the Jews, or the Presbyterians are ruining the country, you may ask yourself: "What is this patient trying to do to me or to get me to do to him?" In my field, we are acutely aware of this, so that we always pay attention to our own feelings and to what the patient arouses in us. We know that there are reasons for sudden boredom, excessive sympathy, and excessive involvement with patients beyond that called for in terms of professional function. We remain vigilant for irritation, for forgotten appointments, and for tardiness in keeping appointments.

The way in which these attitudes may affect one's judgment is not usually blatant. From my own experiences as a physician who sometimes has to do painful things to people, I know that it does become reflected in how we do what must be done. It is reflected in whether we make the procedure more painful than necessary or whether we are so afraid of causing a patient pain that we beat around the bush so long that both of us are petrified at what has to be done.

We see, then, that there are reciprocal relationships which develop merely because the patient and the dentist are both human beings and, as such, bring deeply ingrained and hidden attitudes to the professional treatment problem. These attitudes from both sides may affect the success of treatment which, after all, must remain our primary concern.

These things happen in children, too, but it is a little different because children are not adults who want to be treated like children, who want someone great and powerful to take care of them, and who thus endow us with skills and strengths that we do not necessarily have. To the child we *are* adults, and in a very real way we have the kind of control and strength which he thinks we have. However, the same mechanisms that we have discussed operate in our relationships with children and we must remain aware of them.

One thing that occurs to me in this connection is the fact that many of the things that we do to children are either painful or experienced by the child as being painful. Furthermore, they are not "one shot" things. They are more likely to be long, drawn-out, repeated manipulations of one sort or another. The only way I know to enlist the confidence and cooperation of a child is to be scrupulously honest. To tell a child that we are going to have to do this only once or to tell him that it will not hurt, when these statements are not true, is to lead him deliberately into inevitable disillusionment, with a concomitant lack of confidence and trust in the adult who cares for him.

This is further complicated for us by the fact that the child's concerns involve not only his doctors but his parents as well. Doctors and parents become partners in either a positive or a negative sense to much treatment. This is our problem because we are dealing not only with children but also with their parents. In some way we have to ensure the success of our efforts by trying to enlist the wholehearted cooperation and investment of both the parents and the child, but we must realize that this may be very difficult for the mother. It may be the old story of a child who gets a sliver. The parent tells him it won't hurt and removes it. Then the second time the child gets a sliver he hides it until it is grossly infected. At least, this happens commonly enough that we may well wonder about it. We may find ourselves in the position of wanting to be honest and truthful with the child and yet finding that the mother fights us tooth and nail because she thinks that this will upset the child. She does not want us to tell him that he is going to have to do this and that and that when he gets all through something else will start. We may well find ourselves in a curious conflict with mothers about this. In our own experience, if time permits, we find that it is as important to prepare the mother as to prepare the child. In dealing with both, we insist on honesty and attempt to anticipate as much as possible all the things that will happen, taking especially into account the little things which may frighten a child. In cleft palate work where surgery and hospitalization were indicated, we have made it a point to take the child there first to show him what was going to happen, to introduce him to the nurse, to show him the wards and the toys, and then to go over, step by step, what is going to happen to him.

One school of thought seems to be that this frightens the child unnecessarily and causes him to worry about the experience. If we could quite honestly say that he was not worried already and that we might never have to do anything to him in a hospital or in the office again, we might give credence to this. We feel that there is some benefit to this kind of worry, not the least of which is the response that I myself have heard numerous times when I have visited children who were properly prepared: "It happened just like you said." This is a crucial kind of trust if we have to work with this child again.

One question which usually plagues us is whether the mother should be present while the child is being worked on. There can be no general rules about this. One plays it by ear, keeping in mind that the child may have something to say about this himself. Ideally, if time permits, this is something that can

be discussed with the child. With younger children it is almost always necessary to have the mother in the room, but again we must be aware of the pressures that are being placed on us, not only by the child but by the mother as well.

I saw an example of this in a cleft palate center, and I see it all the time in barber shops. A mother anxiously hovers around a child, saying: "He's not going to hurt you. He's not going to hurt you, etc." There you are with instruments in hand, knowing full well that you have to do something that is going to be moderately painful to this child. What are you going to do? Are you going to say: "Look, Sonny, your Mommy is lying"? You cannot alienate the mother, either by this kind of statement or by insisting that she leave the room, which might be terrifying to the child. One must try to think of some way to be honest and reassure both the child and the mother. I think that in such an instance I would have tried to say something like this. "Bobby, your Mommy is really concerned about what is going to happen to you. She does not want you to get hurt, and I can understand this. But what I have to do is going to hurt you a little bit. I don't think it is anything that you can't stand, and your Mommy and I are both going to be here to help you." This explains to the mother something of what she is doing, and it gives both of them a more realistic appraisal of what is going to be done than if you say: "Yes, it won't hurt; let's do it fast." To the child, this last approach is utter duplicity. You have failed him, and he knows that he has been tricked by both his mother and his doctor. He may very well put more of the blame for this on the doctor's shoulders than on the mother's because this is a safer place to put it. Considerate, realistic honesty is crucial to both long- and short-term treatment. As you well know, the success of a long treatment period in which appliances must be worn depends on the child's cooperation and his feelings about you. Often one can beneficially effect this by remaining aware of the child's feelings, the mother's feelings, and one's own feelings. Like jugglers, we must try to maintain honesty and trust within the mother, within the child, and within ourselves. The pressures of time too frequently cause us to ignore the possibility that a mother and father may be superimposing their own very personal concerns on the child; this sometimes can be circumvented by incorporating the parents into the planning around the child's care.

One last word concerns flexibility. What works with some does not work with others. That is as it should be, however great the strain it places on our ingenuity. It is worth the effort, for good orthodontic care is nullified more frequently by the things that have been discussed here than by perhaps any other single factor.

ERUPTION OF HUMAN TEETH

RAM SARUP NANDA, B.D.S., PH.D., F.I.C.D., F.A.C.D.,* LUCKNOW, INDIA

THE process of eruption of human teeth has been of considerable interest to man since early times. The spectacular nature of the dentition, which is so different from any other phenomenon in human growth, and the regularity with which each tooth appears led even the ancient observers to consider the dates of eruption as landmarks for the chronology of man.

A review of the literature revealed a number of investigations on the chronology of teeth. The data reported varied from simple age ranges during which a tooth might emerge to more definitive standards. In contrast to permanent dentition, the standards for the emergence of deciduous dentitions were relatively few and not sufficiently established. The relative lack of information concerning the deciduous dentition was probably due to difficulty in collecting data on children of young enough age that they seldom visit the dentist.

Most of the statistics have been derived from cross-sectional material. There were a few exceptions, however, in which longitudinal material was used (the works of Doering and Allen[1] and Robinow and associates[2] on the deciduous dentition and of Stones and colleagues[3] and Fulton and Price[4] on the permanent dentition). It was apparent from a study of these as well as several other reports that no general agreement existed concerning the norms for the ages of tooth eruption. All of the authors, however, unanimously agreed that a wide margin of variation existed in different tooth pairs, individuals, and population groups.

One question which did not receive sufficient attention was the extent to which alterations in the range of variation with age might be expected. We know, for example, that at the age of 6 years a boy may have no permanent teeth, or as many as twelve may have erupted. The outstanding question, then, is: "Should one expect nearly the same range of variation at all ages, or would it be different?" If the range is more at some ages and less at others, then it may be easier to spot a child suspected of growth disturbance. A child with impairment in the developmental processes will stand out more prominently at an age when the range of variation in the eruption of teeth is minimal than at an age when it is maximal; thus, the chances of isolating pathologic cases is increased. Of course, it should be remembered that retardation or precocity of

This investigation was completed during a research fellowship at the Child Research Council, University of Colorado School of Medicine, Denver, Colorado (1952-1955).

*Lecturer in Dentistry, Dental College and Hospital, Lucknow University, Lucknow, India.

tooth eruption alone cannot be deemed sufficient criterion upon which to base the diagnosis of a disturbed condition. In addition to knowledge of the stage of dentition, other physical and physiologic factors would have to be taken into consideration.

It will be recalled that standards of tooth emergence vary greatly from one population group to another, even in the same race, and may be altered by changing environmental conditions. In view of this fact and others just mentioned, it was regarded desirable to analyze the longitudinal records on dentition collected at the Child Research Council in Denver during the last twenty-five years.

DATA

This investigation utilizes the longitudinal records collected at the Child Research Council. The subjects participating in the study are being followed individually throughout their life spans. Since the research program of the Council has been progressively expanding and new subjects have been admitted from time to time, the children were at varying age levels at the time of the study. For this and other reasons, the number of children studied at all ages was not the same.

The character and nature of the program of the Child Research Council has been discussed in detail by Waldo[5] and Washburn.[6] It may be of advantage to state here that the children were descendants of population groups originating in northern and western Europe. They were, generally speaking, healthy, growing children belonging to families of upper middle-class socioeconomic status.

Material pertaining to the eruption of teeth was contained in a variety of records, namely, the periodic health reports filled in by the parents, the pediatric and dental examinations, dental casts, head radiographs, and occasionally nutrition histories. Most information was derived from the pediatric and dental examinations, dental casts, and radiographs. The last three were yearly observations, while the pediatric reports were made on a quarterly basis. Some of the pediatric examinations on the teeth were not sufficiently accurate, due to difficulties in the correct identification of the teeth. A more careful study of the records, however, showed that with proper and thorough checking, including verification by all the sources of data combined, exact and reliable enough material could be obtained for a detailed analysis on the eruption of teeth at three-month intervals.

Data on the third molars were not included in the present study, since too few children were old enough to have erupted them. In addition, the vagrant tendencies of these teeth, such as malposition and agenesis,[7, 8] render them rather difficult to study.

METHOD OF ANALYSIS

The information on the emergence of teeth assembled from the different sources just mentioned was recorded on a specially designed form for each child. On this form the date of eruption of each of the deciduous and permanent

teeth and the dates of shedding of deciduous teeth on the right and left sides and in the maxilla and mandible were recorded separately.

A tooth was considered erupted or present when any part of its crown was visible in the oral cavity. From the work sheets thus obtained, the data were classified according to the number of teeth present at each age and the time of eruption of each tooth. Before considering the data for these two aspects of odontology, it was found necessary, in order to prevent spurious results and to assure material of maximum reliability, to exclude from the analysis four types of data as follows:

1. Teeth extracted due to accidents and disease or for orthodontic reasons were not included.

2. If the loss of a deciduous tooth was due to an extraction, the time of eruption of its corresponding successor was not counted, since the effect of premature extraction of a deciduous tooth on the precocity in eruption of its successor is still disputed.

3. In instances of agenesis of one or more permanent teeth, the time of exfoliation of the corresponding deciduous teeth was not taken into account, since quite frequently in such cases the deciduous teeth may be retained intact for a longer than usual length of time.

4. If the tooth records were found to be either faulty or lacking at a particular age in a particular child, new teeth which had emerged by the following examination were not counted, since it was not possible to determine exactly their true chronology. The count of teeth, and hence of individuals concerned, was continued, however, when the records had been made for two consecutive quarters. This is another reason for the varying number of children at each age, as well as for the discrepancy between the number of examinations of teeth of the right and left sides. The number of children for each age group ranged from 34 to 63 boys and 27 to 61 girls. Among these, 70 per cent of the groups contained more than forty subjects.

FINDINGS

The compiled data were analyzed with the following four objectives, each of which will be discussed singly:

1. To show the group patterns of both boys and girls.

2. To study and compare an individual child in relation to the whole group.

3. To study the sequence of eruption in relation to occlusion.

4. To determine possible correlation between dental and physical maturation.

Group Patterns of the Process of Tooth Eruption.—The number of teeth present in either jaw of boys and girls was tabulated for each three-month interval. Children with a similar number of teeth present at a given age were grouped together. From the frequency distribution of the number of teeth

present at various ages, graphs were made to describe the patterns for the deciduous and permanent teeth.

Deciduous teeth: The graphs in Figs. 1 and 2 show the percentage of boys and girls with a given number of teeth present at each age. Each of the teeth from 0 to 10 is represented in the figures by a square area which, when completely shaded, indicates that the particular tooth was present in 100 per cent of the children. If, however, the square is not shaded at all, it reflects the fact that none of the children in the group had the tooth which that square happened to represent. Note that "no teeth present" and "all teeth present" are indicated as positive states in these figures. Various amounts of shading, of course, represent the percentage of either boys or girls who have that tooth at that age. In this manner, two different traits of the timing of dentition are shown in the figures, namely, the number of teeth present and the proportionate distribution of individuals at the end of each three-month age interval.

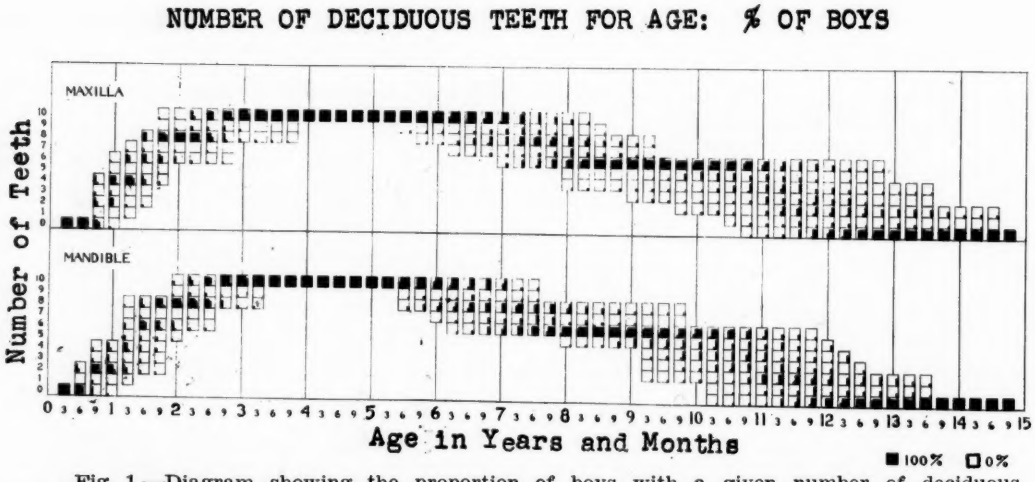

Fig. 1.—Diagram showing the proportion of boys with a given number of deciduous teeth in each jaw at each age from the state of no teeth in all boys (solid black squares at far left), to all ten teeth in all boys (solid black squares at top of patterns), to complete absence of all deciduous teeth (solid black squares at far right). The blacked-in portion of each square indicates the percentage of boys with the corresponding number of teeth at that age.

It will be apparent from Fig. 1 that at the age of 3 months 100 per cent of the boys had no teeth present in either the mandible or the maxilla, whereas at 6 months a small percentage have two teeth in the mandible while none of them have any maxillary teeth as yet. The figures also show that a small percentage of the children do not have any teeth until they are 1 year 3 months old. In addition to showing the variation in the age when one or more teeth are present, the graphs in Figs. 1 and 2 also show the range of variability at any given age. For example, a boy aged 1 year 3 months may have as few as one or as many as eight teeth present in the mandible. It must, of course, be borne in mind that a predominant concentration of shaded area in any single square indicates that a greater percentage of the boys have the designated number of teeth present. The bars of squares in these figures show

quite clearly the amount of variation to be expected at each age according to the degree of scatter of the shaded area. A comparison of the proportion of boys in Fig. 1 having a given number of teeth present in the mandible at ages 1 year 3 months and 2 years will reveal that a boy may have from one to eight teeth present at the former age and from five to ten teeth present at the latter age. Although the range of variation at these two ages is similar in quantity, it was noted that an overwhelming majority of boys at the later age period had eight teeth present, in contrast to a relatively even distribution of from one to eight teeth at the age of 1 year 3 months. Also, the figures show that more children have an even rather than an odd number of teeth present. This has been interpreted to be due to the fact that two teeth of a like pair usually emerge in close succession to each other and that the quarterly interval between our observations was not small enough to pick up finer differences in the ages at which teeth erupt.

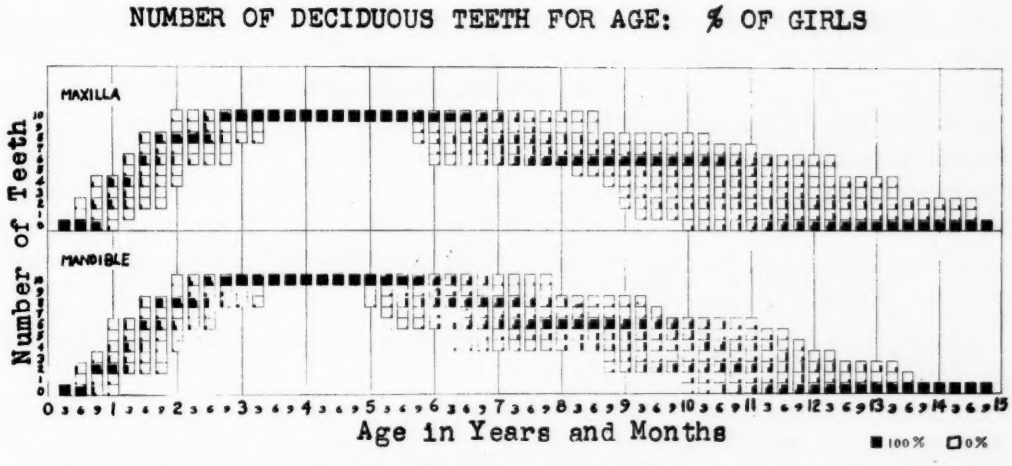

Fig. 2.—Diagram showing the proportion of girls with a given number of deciduous teeth in each jaw at each age from the state of no teeth in all girls (solid black squares at far left), to all ten teeth in all girls (solid black squares at top of patterns), to complete absence of all deciduous teeth (solid black squares at far right). The blacked-in portion of each square indicates the percentage of girls with the corresponding number of teeth at that age.

In addition, the figures show that there is a steady rise in the number of teeth present in either jaw until the stage at which eight teeth are present in each of the jaws. This is followed by a quiescent period, which may be as long as a year or even more, before the remaining deciduous teeth appear in a jaw. This quiescent period was more marked and more consistently seen when individual case records were examined. After both the maxilla and the mandible had a full complement of erupted deciduous teeth, no clinical changes were seen until the age of 5 years in the girls and 5 years 6 months in the boys, when the shedding of deciduous teeth started.

The process of shedding of the deciduous teeth has also been portrayed in Figs. 1 and 2. The marked variation in the frequency distribution and the range in the number of teeth present at each age were quite obvious. Here, again,

when four deciduous teeth were lost from a jaw, there was a quiescent period during which no change in the status of the deciduous dentition was seen. Although Figs. 1 and 2 do not reveal the morphologic characterization of the four deciduous teeth, it may be mentioned that these teeth were almost always the central and lateral incisors. This period was of a significantly long duration, which will be discussed more in relation to the corresponding period in the eruption of permanent teeth. It may be well to state that the processes of shedding of deciduous teeth and emergence of permanent teeth occur simultaneously. They have been discussed separately here only to avoid confusion. When the quiescent stage was over, shedding of the rest of the teeth followed a more or less continuous process up to the ages of 13 years 9 months for the mandible and 14 years 9 months for the maxilla, when all the deciduous teeth were found to have been shed in both sexes.

A careful examination of Figs. 1 and 2 reveals that there was little difference between the sexes in the number of teeth erupted with age. A reasonably marked difference was seen, however, between the maxilla and the mandible. With regard to both eruption and shedding of deciduous teeth, the mandible appeared to be ahead of the maxilla at all ages. For example, it was noticed in Fig. 1 that at the age of 6 months a small percentage of boys had two mandibular teeth erupted and that at the same age none of them had any teeth in the maxilla. This difference between the maxilla and the mandible became very prominent in both sexes at the ages when all the deciduous teeth were shed, those ages being 13 years 9 months for the mandible and 14 years 9 months for the maxilla.

Permanent teeth: The pattern of eruption of permanent teeth is illustrated in Figs. 3 and 4.

It may be observed from Figs. 3 and 4 that the differences in dentition of boys and girls were relatively more clear than those seen in the eruption of deciduous teeth. The girls had a greater number of teeth present at almost every age. For example, it will be seen that whereas a small percentage of girls had one mandibular tooth present at the age of 5 years, it was not until the age of 5 years 6 months that boys demonstrated the eruption of that tooth. Similarly, the age of completion of the permanent dentition in both the jaws (with the exception of third molars) was three months earlier in girls than in boys, the ages being 15 years and 15 years 3 months, respectively. This small difference, although manifest at most age levels, did not exceed six months in the group as a whole. When the means of the age of completion of the permanent dentition of forty-two boys and thirty-five girls are compared statistically (boys, 157.14 ± 1.94 months; girls, 153.09 ± 2.05 months), the difference of only 4.06 ± 2.82 months could occur by chance alone fifteen times in 100; hence, according to the common statistical usage, it is not significant. This small difference in timing may prove to be statistically significant for larger samples, however, and it is in line with the usual sex differences of earlier maturation in girls than in boys.

The differences between the two jaws with respect to the number of teeth present were, on the other hand, more marked, as shown in Figs. 3 and 4. The

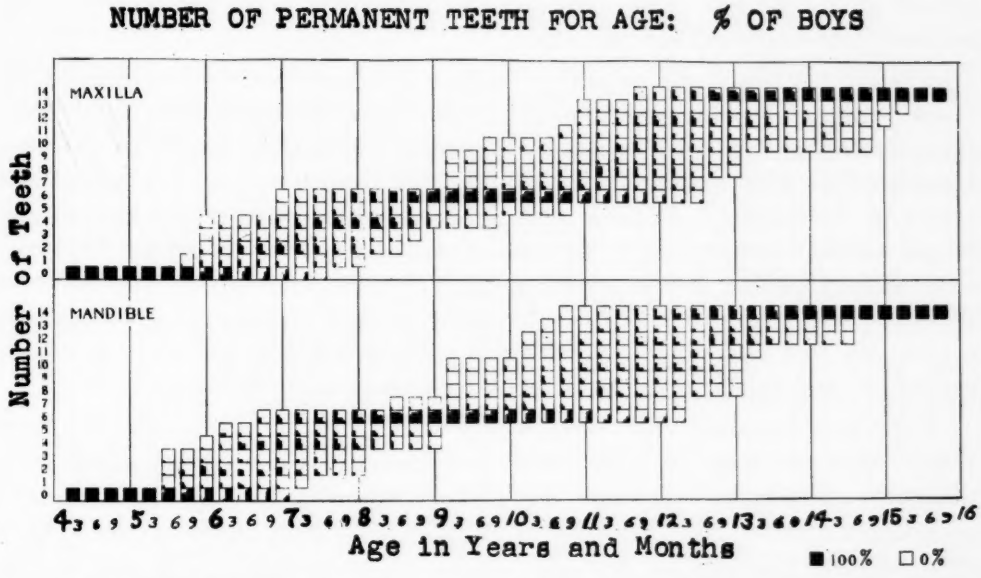

Fig. 3.—Diagram showing the proportion of boys with a given number of permanent teeth in each jaw at each age from a state of none in all boys (solid black squares at far left) to all fourteen teeth present in all boys (solid black squares at upper right end of patterns). The blacked-in portion of each square indicates the percentage of boys with the corresponding number of teeth at that age.

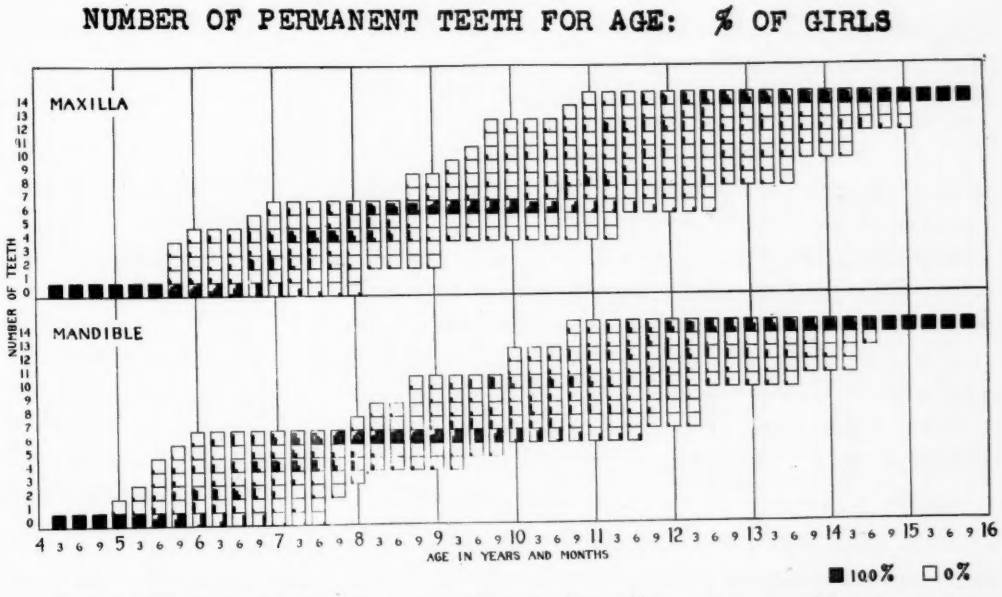

Fig. 4.—Diagram showing the proportion of girls with a given number of permanent teeth in each jaw at each age from a state of none in all girls (solid black squares at far left) to all fourteen teeth present in all girls (solid black squares at upper right end of patterns). The blacked-in portion of each square indicates the percentage of girls with the corresponding number of teeth at that age.

mandible was found to be about six months ahead of the maxilla. This difference could be observed at all ages and was seen quite consistently, even when the cases were examined individually.

The range of variation in the frequency distribution of the number of teeth present with age in both jaws was large, but at some age periods its limits were relatively narrower than at others. For instance, in Fig. 3 the range of variation was smallest in boys at the ages of 8 years 3 months in the mandible and 9 years in the maxilla. At these ages the whole group of boys had either four, five, or six teeth present, and this was the maximum variance seen. This contrasts with other age groups, particularly 12 years, when a boy may have as few as six or as many as fourteen permanent teeth in either jaw. This pattern of variation has been displayed quite vividly in Figs. 3 and 4, and even a cursory examination of these figures will be sufficient to confirm this fact.

Figs. 3 and 4 show that there was a steady rise in the number of teeth present until the stage at which each jaw had six teeth. At this point the quiescent period began. The period of rest between the stage at which six teeth had erupted and the time when seven or more teeth were present ranged from twelve months to forty-nine months in different individuals. This period corresponds exactly with the quiescent period noted in the shedding of deciduous teeth, which was mentioned earlier. The quiescent period is evident in Figs. 3 and 4 from the greatest concentration of shading at the six-teeth level in each jaw, when the children have a period of rest before erupting more teeth.

To determine whether the general impression gained from Figs. 3 and 4 that children who erupted six teeth early were also the first to erupt the seventh tooth after completion of the quiescent period, the data were subjected to statistical analysis for each jaw separately. The results have been summarized in Table I.

TABLE I. COMPARISON OF THE AGE AT WHICH SIX PERMANENT TEETH WERE PRESENT WITH THE AGE AT WHICH SEVEN OR MORE TEETH WERE PRESENT

SEX	NO. OF CASES	JAW	MEAN AGE AT WHICH SIX TEETH WERE PRESENT (MONTHS)	MEAN AGE AT WHICH SEVEN OR MORE TEETH WERE PRESENT (MONTHS)	COEFFICIENT OF CORRELATION r	STANDARD ERROR OF r
Male	44	Maxilla	101.98	130.16	0.6592	0.0862
	46	Mandible	94.63	126.41	0.6958	0.0769
Female	29	Maxilla	98.97	124.90	0.7255	0.0895
	36	Mandible	90.67	116.78	0.8712	0.0407

The coefficient of correlation r and the standard error of r indicated that there was a significant relationship betwen the age at which six teeth were present and the age at which seven or more teeth were present, thus supporting our general impression. Since this was a quiescent stage, which was common to both the permanent dentition and the shedding of deciduous teeth, the results of the statistical analysis (Table I) for the permanent dentition would obviously apply to the latter also.

As this quiescent period was completed in each child and the number of teeth present increased, the distribution became quite variable. This was apparent from the increased range of the number of teeth present with age until the final stage was reached, when a full complement of permanent teeth (third molars excluded) was found to be present.

Another characteristic of the general group patterns that was studied concerned the comparative ages at completion of the deciduous and permanent dentitions in both boys and girls (Table II).

TABLE II. COMPARISON OF THE AGES AT COMPLETION OF DECIDUOUS AND PERMANENT DENTITIONS

SEX	NO. OF CASES	MEAN AGE AT COMPLETION OF DECIDUOUS DENTITION (MONTHS)	MEAN AGE AT COMPLETION OF PERMANENT DENTITION (MONTHS)	COEFFICIENT OF CORRELATION r
Male	26	32.42	156.92	0.5926
Female	16	33.38	148.56	0.1882

The correlation coefficients obtained were interpreted to be of borderline significance in boys and of no positive significance in girls. Since the number of individuals available for this inquiry was very small, the results require cautious interpretation.

Study and Comparison of an Individual Child in Relation to the Whole Group.—To determine a method by which we could trace the pattern of tooth emergence of each child and compare it with the patterns of other children, the median age of eruption of each tooth was determined. These median ages for both the right and left sides of each jaw in each sex were graphed, and the points thus plotted were joined together in the order of arrangement of teeth in the dental arch, as shown in Fig. 5. This procedure produced interesting diagrams which showed the striking similarity of the ages of eruption of the corresponding teeth on each side in addition to the order of eruption of the deciduous and permanent teeth. Against the background of these standards it was possible to plot the time of eruption of teeth in an individual; this revealed how far a particular child deviated from the median order and age of eruption. Although this method of analysis pointed out eruption patterns of the group as a whole in fine detail, tracing and studying the individual patterns against this type of group pattern was found to be a cumbersome process. To overcome the merely technical handicaps inherent in this method, we used a different approach which resulted in the development of tooth eruption standards that were relatively easy to use and comprehend.

In the preceding analysis we had found that the time of eruption for each tooth of a like tooth pair in a jaw was the same. This marked symmetry, of course, was not always witnessed at the individual level, since there were many deviations. Nevertheless, the deviations were small when the possible experimental error in recording the original observations was taken into account. A number of other investigators[4, 9-11] have had similar experiences in their studies when they have found little or no difference in the time of eruption of

the same types of teeth on the two sides of a jaw. In view of these considerations, it was decided to combine arbitrarily the data of the right and left sides of each like pair of teeth at every age level. These data of frequency distribution and cumulative frequency curves or ogives were drawn for each of the teeth, as shown in Figs. 6 and 7. In these figures the ordinates show the deciles, and the abscissae represent the ages. When drawn through the plotted points, the ogives for the deciduous teeth were remarkably even and little smoothing was necessary. The ogives of permanent teeth, however, were found to require smoothing. This was done by drawing in smooth trend lines by inspection with

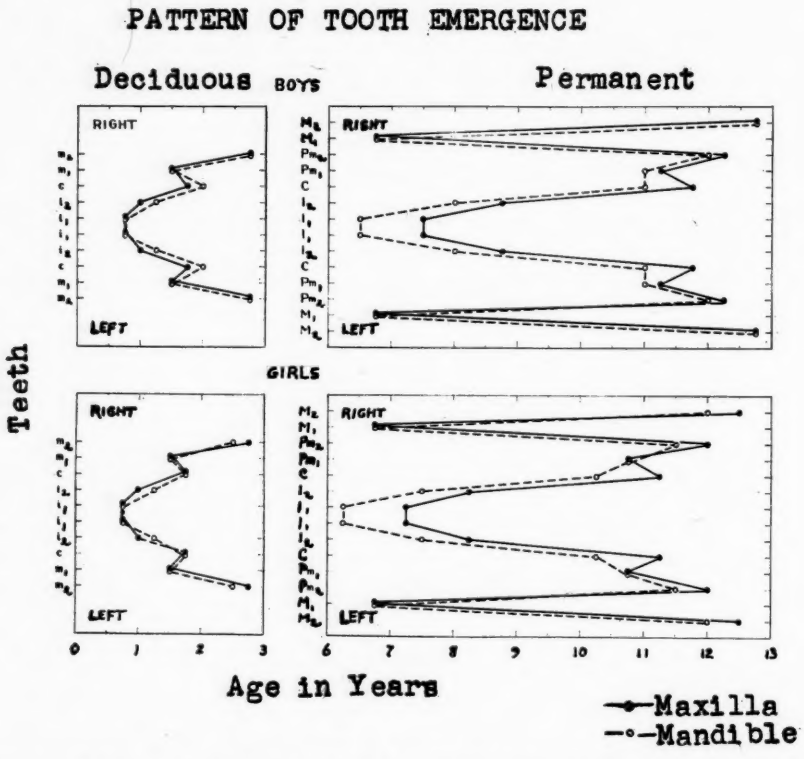

Fig. 5.—Pattern of eruption illustrated by plotting the median time of eruption.

the aid of a French curve. Examples of minimum and maximum smoothing required are shown in Fig. 8, which portrays the cumulative frequency curves of mandibular first and second molars in boys. It is evident from Fig. 8 that, whereas the actual plotted values were almost on the trend line for the first molar, the like values for the second molar were relatively more deviant. The latter finding, however, was considered insignificant since the maximum fluctuation observed was about three months—the same as the minimal time interval between our successive observations on the children.

In the graphs shown in Figs. 6 and 7, broken lines were drawn, marking the twenty-fifth and seventy-fifth percentiles. The fiftieth percentile represented the median time of eruption. The graphs were found to be simpler and

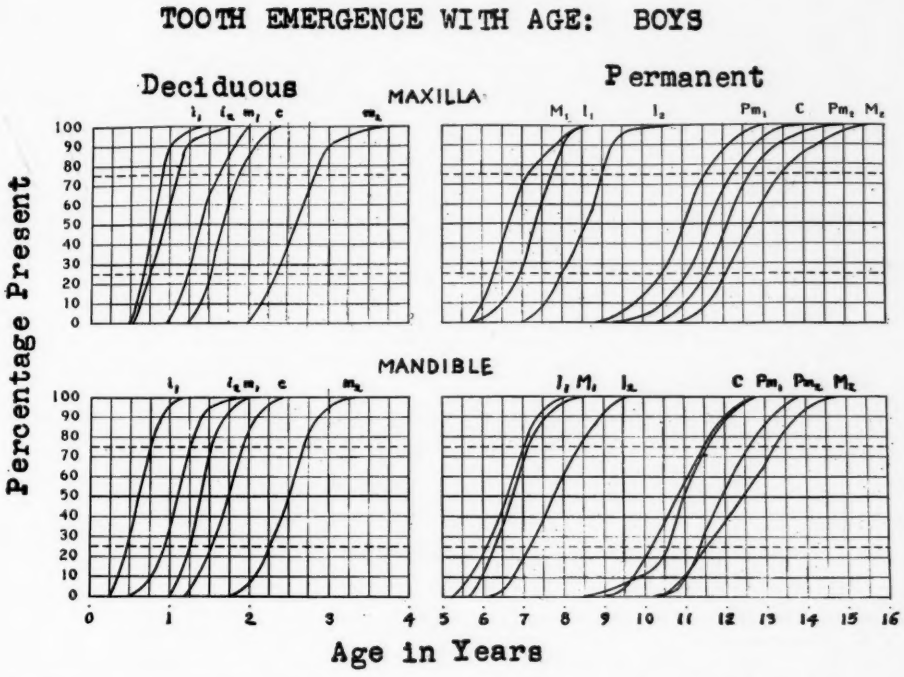

Fig. 6.—Curves of cumulative relative frequency distributions of each deciduous and permanent tooth present in boys.

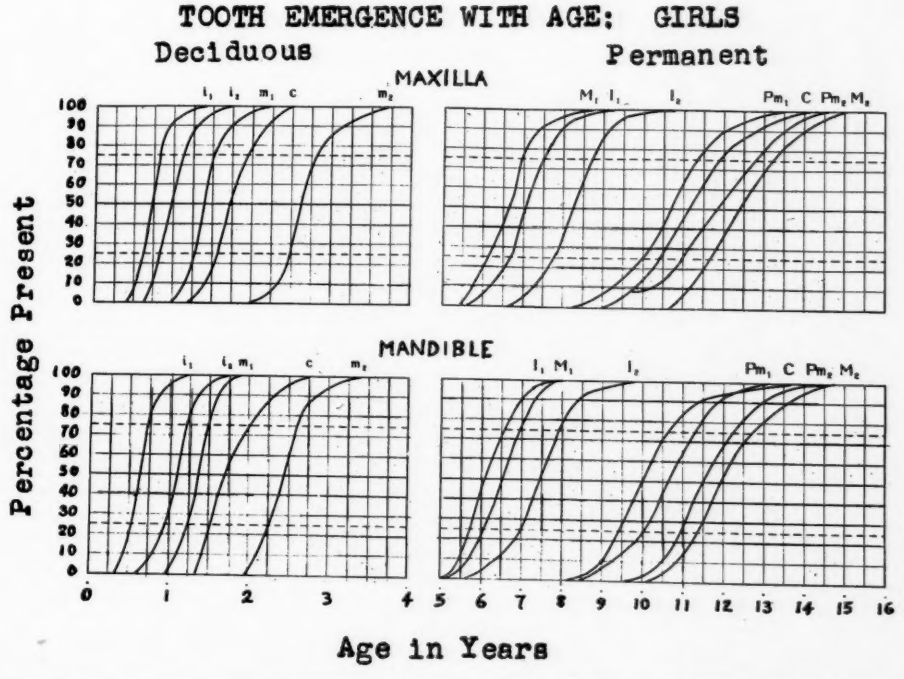

Fig. 7.—Curves of cumulative relative frequency distributions of each deciduous and permanent tooth present in girls.

easier to understand for both the group and the individual patterns. The time of eruption of each tooth of an individual could be plotted on this graph, thus revealing the manner of his fluctuations from the median with respect to every emerging tooth. In fact, we have made work sheets at the Child Research Council to use in the study of individual patterns of eruption in comparison to those of the group.

In addition to furnishing the standards of tooth emergence, the graphs shown in Figs. 6 and 7 also demonstrated hitherto unrevealed characteristics of the process of tooth eruption. The beginning and end of each ogive on the time scale indicated the length of time taken for a tooth to be present in 100 per cent of the children. This time period was the shortest for the first tooth in the order of eruption and seemed to get progressively longer for every succeeding tooth. This was found to be true for both the deciduous and the permanent dentitions. The figures also point out the sequence of eruption and the time difference between the curves of each tooth.

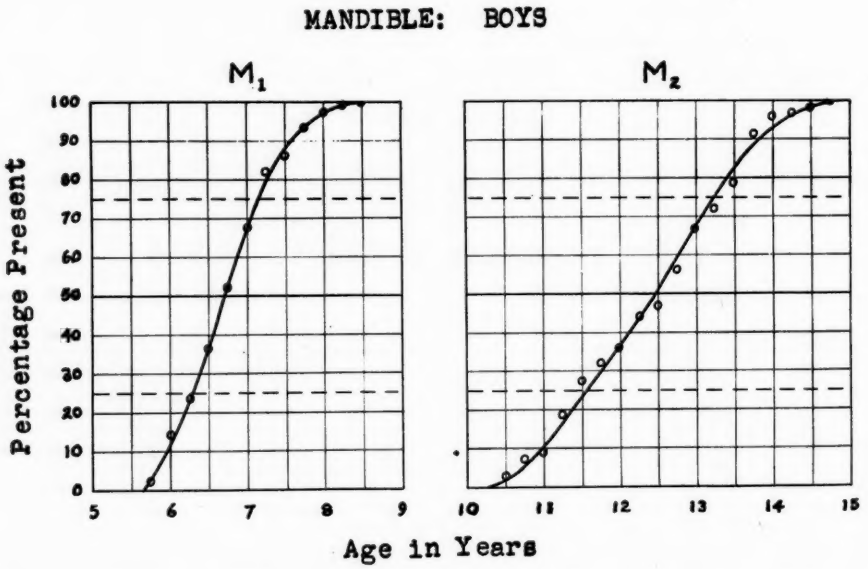

Fig. 8.—Examples of minimum and maximum smoothing required for the cumulative relative frequency curves shown in Figs. 6 and 7.

For the convenience of the reader, median ages of eruption for the deciduous and permanent teeth have been given in Table III.

Sequence of Eruption of Permanent Teeth in Relation to Occlusion.—To study this phase of tooth emergence, records of thirty-four boys and thirty girls with complete permanent dentitions and serial dental casts were used. The occlusion of teeth as observed from the dental casts was rated as good, moderate, or poor for each child. For the sake of uniformity of comparison with the previous studies, this evaluation was based on the mesiodistal relationship of the first molars and on the extent of crowding and spacing seen. For each of these children, the sequence of emergence of teeth was then determined.

TABLE III. MEDIAN AGE OF ERUPTION OF DECIDUOUS AND PERMANENT TEETH IN CHILD RESEARCH COUNCIL CHILDREN

TOOTH	MEDIAN AGE (YEARS)			
	MAXILLA		MANDIBLE	
	BOYS	GIRLS	BOYS	GIRLS
	Deciduous Dentition			
Central incisor	0.78	0.73	0.60	0.64
Lateral incisor	1.00	0.98	1.09	1.11
Canine	1.75	1.73	1.74	1.71
First molar	1.46	1.36	1.38	1.37
Second molar	2.58	2.62	2.50	2.46
	Permanent Dentition			
Central incisor	7.33	7.06	6.60	6.08
Lateral incisor	8.60	8.25	7.75	7.46
Canine	11.63	11.13	10.80	10.00
First premolar	11.04	10.69	10.98	10.65
Second premolar	12.11	11.83	11.92	11.50
First molar	6.66	6.65	6.75	6.52
Second molar	12.71	12.39	12.42	11.94

In the present investigation only three types of eruption sequence were studied in detail, even though other orders of eruption were also encountered. The reason for this limitation was that almost all the children had one of these types of sequence in either one or both jaws. This was also found to be necessary for comparison with the findings of Bengston[12] and Lo and Moyers.[13] The three sequences of eruption considered were as follows:

1. *Child Research Council*
   Maxilla $M_1\ I_1\ I_2\ Pm_1\ C\ Pm_2\ M_2$
   Mandible $I_1\ M_1\ I_2\ C\ Pm_1\ Pm_2\ M_2$
2. *Lo and Moyers (1953)*
   Maxilla $M_1\ I_1\ I_2\ Pm_1\ Pm_2\ C\ M_2$
   Mandible $M_1\ I_1\ I_2\ C\ Pm_1\ Pm_2\ M_2$
3. *Second molars erupted earlier than the second premolars*
   Maxilla $M_1\ I_1\ I_2\ Pm_1\ C\ M_2\ Pm_2$
   Mandible I_1 or $M_1\ I_2\ C\ Pm_1\ M_2\ Pm_2$

The results of this comparison have been summarized in Tables IV and V. From these tables, it will be apparent that the Child Research Council sequence

TABLE IV. COMPARISON OF SEQUENCE OF TOOTH ERUPTION TO TYPE OF OCCLUSION IN THIRTY-FOUR BOYS

SEQUENCE TYPE	JAWS	NUMBER	TYPE OF OCCLUSION		
			GOOD	MODERATE	POOR
Child Research Council	Both	10	3	4	3
	Maxilla	10	5	3	2
	Mandible	9	4	5	0
Lo and Moyers	Both	2	1	1	0
	Maxilla	4	0	4	0
	Mandible	2	1	0	1
Second molars erupted before second premolars	Both	6	1	4	1
	Maxilla	1	0	1	0
	Mandible	6	1	5	0

was present in both jaws in ten out of thirty-four boys and in ten out of thirty girls. In spite of the fact that the Child Research Council sequence of tooth eruption was based on the median ages of eruption, it was also the sequence most frequently observed. The most common sequence of eruption seen by Lo and Moyers was found to be present in both jaws in only three children—two boys and one girl. There were, however, six boys and three girls with a sequence in which the second molars erupted before the second premolars or canines in both jaws. The distribution of other cases in which any of the three orders of eruption were found either in the maxilla or in the mandible is also listed in Tables IV and V. A careful examination of these tables also shows that in our study there was no clear trend toward an association of good occlusion with a particular order of eruption. Due to the limited number of cases available for our study, definite conclusions could not be established in this area.

TABLE V. COMPARISON OF SEQUENCE OF TOOTH ERUPTION TO TYPE OF OCCLUSION IN THIRTY GIRLS

SEQUENCE TYPE	JAWS	NUMBER	TYPE OF OCCLUSION		
			GOOD	MODERATE	POOR
Child Research Council	Both	10	1	7	2
	Maxilla	5	2	1	2
	Mandible	9	2	6	1
Lo and Moyers	Both	1	0	1	0
	Maxilla	2	1	0	1
	Mandible	1	0	1	0
Second molars erupted before second premolars	Both	3	2	1	0
	Maxilla	1	0	1	0
	Mandible	4	1	2	1

Correlation Between Dental and Physical Maturation.—A comparison was made between the age at which all the permanent teeth were present and the age at the maximum rate of the circumpuberal spurt in height in each child. The correlation coefficients r were computed for thirty-four children of each sex. The values obtained for r were 0.2148 for the boys and 0.3784 for the girls. These were interpreted to be too low to express significant correlation.

For comparison, a coefficient of correlation r was computed between the age at menarche and the age at completion of the permanent dentition. This ($r = 0.5922$) was slightly higher than that found for the girls between circumpuberal maximum in height and completion of the permanent dentition, but the difference was enough to bring it up only to the level of borderline significance.

Our findings suggested no close correlation between the timing of dental maturation and puberty. The low level of correlation obtained might have been due to the smallness of our sample, or it might really indicate that there is no specific relationship between the pattern of dental maturation and the pattern of these other physical attributes. What little correlation was found may merely reflect the fact that the physiologic phenomena referred to occur within a limited range of time in any given individual.

An interesting corollary to this finding is the relationship of the growth of the human face to the eruption of teeth. Our previous studies[14, 15] on many of the same children included in the present investigation have shown that the growth of the face followed the same general pattern as the body height. The circumpuberal maximum in both occurred at about the same time in all of the individuals. In view of such a close relationship between the puberal spurt in the growth of face and body height and lack of significant correlation between the time of completion of the permanent dentition and the circumpuberal maximum in body height, one may infer that the growth pattern of the human face is also not significantly correlated to the eruption of teeth. Such a condition, if true, would be an important one to consider in the diagnosis and treatment of malocclusions.

SUMMARY AND CONCLUSIONS

The present study deals with the pattern of eruption of human teeth. The investigation was based on the data collected from the longitudinal records of subjects being studied at the Child Research Council in Denver, Colorado. Data for the jaws and for the sexes were studied separately. The processed data and their analyses have been presented in the form of tables and graphs. The results of the studies may be summarized as follows:

1. Characteristic patterns were observed in the number of teeth present in the percentage of children with age. The graphs, in addition to demonstrating the frequency distribution at each age, also showed that the range of the number of teeth present at each age was different. The most conspicuous of these differences was observed when the range of the number of teeth present was the narrowest at the ages when the majority of the group had erupted six permanent teeth in each jaw.

2. Another significant finding in the pattern of distribution of the number of teeth present concerned the periods of quiescence in the emergence of teeth. The first of these periods was observable in the deciduous dentition when eight deciduous teeth were present in each jaw. The second period, which was also the longer one, commenced when four deciduous teeth had been shed in each jaw or at the corresponding stage in the permanent dentition when six permanent teeth were found to be present. The quiescent periods could also be seen at the individual level.

3. No significant sex differences were noticed either in the number of teeth present at a given age or between the median ages of eruption in the children studied. The actual differences in the median time of eruption in the deciduous dentition ranged from a minimum of 0.01 year for the mandibular first molar to a maximum of 0.10 year for the maxillary first molar. In the permanent dentition, the differences between the sexes varied from a minimum of 0.01 year for the maxillary first molars to 0.80 year between the mandibular canines.

4. The differences between the jaws were, however, quite consistently seen both at the individual and group levels. Mandibular teeth erupted earlier than

their corresponding maxillary teeth, with the exception of the lateral deciduous incisors and first permanent molars, where the reverse was true.

5. A study of three sequences of tooth eruption, usually claimed to be either most favorable or most detrimental to the development of malocclusions, revealed no specific trends. Since the sample studied was small, no definite conclusions could be drawn.

6. Comparison of the age at completion of the permanent dentition with the age at the maximum rate of the circumpuberal growth spurt of height for the two sexes and the age at menarche for the girls showed only low positive correlations. The low levels of correlations obtained may have been due to the smallness of the samples. It was suggested, however, that the low correlations between the physical attributes studied may, in fact, be due to no specific relationship between dental maturation and puberty. The finding may reflect only that the various physiologic phenomena referred to occur within a limited range of time in all individuals.

7. Since the patterns of growth of the human face and body height have been found to be similar and closely related, it may be inferred that the level of correlation between the growth of the face and the dentition would also be low. This result, if substantiated by future studies, would be of considerable importance in diagnosis and treatment planning in orthodontics.

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Department of Orthodontic Abstracts and Reviews

Edited by
DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City.

Abstracts of Papers Presented Before the Research Section of the American Association of Orthodontists, Detroit, Michigan, May 3 to 7, 1959

Analysis of Facial Growth Utilizing Elements of the Cranial Base as Registration: By Toyn O. Nelson, University of Washington, Seattle, Washington.

Serial lateral head films of thirty-one Caucasoid children of both sexes with excellent occlusion, aged 12 to 20 years, were analyzed for elements of the cranial base appearing to be stable (not changing), consistently present, and easily seen. The combination of the plane of the sphenoid bone and cribriform plate of the ethmoid bone seemed to be the most satisfactory for orientation purposes. The midpoint between intersections of the right and left anterior curvatures of the great wings of the sphenoid bone with the plane of the same bone was used as the registration point.

The behavior of certain cephalometric landmarks was observed when superimposing upon the above area in a serial manner for each of thirty-one individual film series. Polygons incorporating point sella, nasion, point A, pogonion, gonion, and articulare were used to express growth changes. The developmental patterns of the anterior nasal spine as well as the palatal, occlusal, and mandibular planes were also noted.

Point sella, when registering upon the area of the cranial base herein mentioned, moved consistently downward and backward or straight downward in every case where growth was actively taking place. Nasion invariably moved forward, but with no consistent pattern in the superior-inferior plane of space.

In selected film series, behavior of other landmarks was noted when registering upon elements of the cranial base as compared to previously used planes of reference.

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An Analysis of the Changes Occurring in Various Cranial and Facial Bones of the Macacus Rhesus Monkey Using Metallic Implants and Roentgenographic Cephalometric Techniques: By Erik Bill Pihl, University of Washington, Seattle, Washington.

Two *Macacus rhesus* monkeys with tantalum implants in the mandible, maxilla, premaxilla, and the zygomatic, frontal, and temporal bones were studied for eighteen months. Serial tracings of lateral, frontal, and superior-inferior head plates were analyzed by various superimposing techniques.

Marked rotation of certain bones in relation to approximating bones was observed. This was attributed to differential sutural growth. Specific areas of surface appositional growth and resorption were also noted. Three implants passed from the original site in the bone into soft tissue by virtue of bone resorption.

The bone apposition and resorption maintained the original morphology and anatomic relation of each bone coordinated to the sutural growth pattern.

2823 W. 66TH
SEATTLE, WASH.

A Serial Study of Cranial Base Morphology as Related to Facial Growth: By Kersam E. Elmajian, University of Washington, School of Dentistry, Seattle, Washington.

The purpose of this investigation was to make a longitudinal study of the skeletal morphology of the cranial base in an effort to determine its most stable element or elements. With reference to this skeletal contour of relative stability, an evaluation was made of the amount, degree, and nature of movement resulting from growth of certain selected cephalometric landmarks as observed in serial lateral headfilms of thirty-two Seattle Caucasoid children, approximately 8 to 14 years of age, exhibiting excellent dental occlusion.

Following experimentation with four superimposition combinations utilizing seven different cranial base contours on the original and terminal films of each subject, a contour of relatively fixed proportions to be used as a reference area was established. The plane of the sphenoid bone and the cribriform plate of the ethmoid bone are superimposed, registered at the intersection of the midpoint of the right and left great wing curvature with the sphenoid plane—cribriform plate contour.

Utilizing this reference area, the nature of movement of the following cephalometric landmarks was assessed for each subject by means of pattern templates, with the head maintained in the Frankfort position: sella, nasion, ANS, point A, gnathion, gonion, and articulare, in addition to the palatal, occlusal, and mandibular planes.

Of primary interest is the finding that point sella in every case moved either in a downward or downward and backward direction and that nasion moved upward and forward, straight forward, or downward and forward with marked irregularity.

The concomitant change in the pattern of facial growth resulting from a comparison of this reference method with other commonly used techniques was noted in a representative number of subjects.

728 N. 46TH ST.
SEATTLE, WASH.

The Conformation of Facial Soft Tissue as Revealed in Lateral Cephalometric Roentgenograms: Its Importance in Facial Esthetics. By Gershon A. Stern, University of Tennessee, College of Dentistry, Memphis, Tennessee.

Thirty young women with superior to excellent occlusions were divided into two groups by ten orthodontists, who ranked them from 1 to 30 on the basis of facial esthetics. To do this, three photographs of each subject—frontal without expression, frontal with subject either smiling or with pleasant

expression, and true profile position—were appraised. From their averaged opinions, two groups were formed: Group I contained twelve women with the most pleasing faces, and Group II contained twelve women with the least pleasing faces. The purpose of this investigation was to determine whether or not there was a significant difference between the soft tissue measurements of the two groups.

By means of lateral cephalometric roentgenograms, various hard and soft tissue angular and linear measurements were computed for each group. Although this was basically a soft tissue study, several major skeletal measurements were used to discover whether or not any skeletal anomalies existed. The mean, range, standard deviation, and standard error of both hard and soft tissue measurements were computed.

With the exception of the SNA reading in Group I and the NAP and N′A′P′ (corresponding soft tissue measurements were designated by ′) readings of both groups, the standard deviations were below 3.7, which indicated similar values within each group.

The "t" test was used to determine whether or not a significant difference between the arithmetic means of the various hard and soft tissue angular and linear measurements of Groups I and II existed. No significant difference was found between any of the means; therefore, it was concluded that the differences between the means could have come about by chance.

108 N. 8TH ST.
VINELAND, N. J.

A Cephalometric Study Made of a Sample Selected From Approximately 50,000 Children: By William Joseph Hardin, University of Kansas City, School of Dentistry, Kansas City, Missouri.

Approximately 50,000 children were examined by dentists and lay personnel in 1958 for the annual "Smile of the Year Contest" sponsored by the Oklahoma State Dental Association. The sample used here represents beauty in the eyes of the dentist and lay personnel. The soft tissue profiles in these cases should be given consideration in the prognosis of cases.

Of the sixteen finalists, two were eliminated—one for having had orthodontic treatment and the other for racial differences. The age range was 12 to 15 years, inclusive.

Cephalometric head plates were taken and a study was made to determine the need for standardization of the sample used in the various analyses. In this comparison seventeen measurements were used—ten skeletal and seven dental. These findings were compared with those of Riedel, Downs, and Gatti.

It appeared that the range was more important than the mean, for both the male and female winners had some measurements at one extreme or the other of the range. An attempt to make a diagnosis in a child by comparing him with children of another age group completely disregards growth. Growth should be given definite consideration when children are treated before they reach full maturity.

No one angle or group of angles can tell exactly what the diagnosis or treatment should be.

2418 CIRCLE DR.
BARTLESVILLE, OKLA.

An Investigation Into Human Head Balance: By William A. Heisel, University of Michigan, Ann Arbor, Michigan.

An investigation was made to determine human head balance as represented by the Frankfort horizontal plane to the true horizontal plane. Fourteen subjects were photographed after being positioned in a characteristic pose by means of distant vision. The method for measuring the relationship of the Frankfort horizontal plane was checked for error and found reliable. The mean values for the group showed the Frankfort horizontal plane to correspond closely to the true horizontal plane, but there was a wide range of individual variation. Head balance records also showed individual variation between and within appointments. Little difference was found between the values for standing or sitting. Regardless of the cephalometric plane of orientation, recognition was given to individual variation from the true horizontal plane.

The following conclusions were drawn:

1. The group value for variation of the Frankfort horizontal plane to the true horizontal plane was +1.5 degrees, with a standard deviation of 6.1 degrees for standing and –3.0 degrees with a standard deviation of 5.0 degrees for sitting.
2. The group value shows that there is a temporal pattern of change in head posture.
3. Individuals show different patterns of variation of head balance between and within appointments.
4. Group and individual data recorded little difference between standing and sitting positions.
5. There is variation within appointments regardless of the plane of orientation.
6. The variation, for the group, of the sella-nasion plane was +10.3 degrees (mean) and the variation of foramen magnum was +5.3 degrees (mean).

14007 Greenview Rd.
Detroit, Mich.

A Cephalometric Analysis of Effective Mandibular Length Changes in Patients Treated With the Andresen Appliance: By Robert W. Browne, A.B., D.D.S., University of Michigan, Orthodontic Research Centre of Burlington, Ontario.

This study was designed to determine whether or not changes in mandibular length that would not otherwise occur appear with Andresen activator treatment.

A series of patients with Angle Class II malocclusions treated with the activator were compared cephalometrically with a random sample of untreated children of like age. The results thus far seem to indicate that increments of mandibular length might be greater in the experimental group during a comparable period of time.

1409 Normandy
Ann Arbor, Mich.

A Study of Concomitant Changes Produced in the Faces of Children Undergoing Orthodontic Treatment: By Francis George Jones, D.D.S., Department of Orthodontics, University of Washington, Seattle, Washington.

A comparison was made of the magnitude of the changes resulting from cervical anchorage treatment of two groups of children, one group consisting

of children with good facial patterns and the other consisting of children with poor facial patterns. No significant differences were detected. The relative changes appeared to be in proportion to the severity of the pre-existing discrepancy. In order to exemplify the relative responses to headcap treatment, a number of case analyses were described and an attempt was made to account for the improvements in the molar relationship, the convexity of the face, and the relationship of the denture bases to one another. Cases from both groups were presented.

5716 5TH AVE., N.E.
SEATTLE, WASH.

Growth and Its Relation to Orthodontic Relapse: By Robert Russell Kelley, D.D.S., University of Washington, Seattle, Washington.

This study is an analysis of the occlusion of treated orthodontic cases, free of all retentive devices, from the standpoint of the degree of relapse and the effect of craniofacial growth.

Thirty completed orthodontic cases treated by graduate students at the University of Washington were studied. These patients had been out of retention for periods varying from one to five years. The cases were divided as to good or poor facial skeletal patterns by assessing the relation of the maxillary and mandibular apical bases in an anteroposterior dimension (angle A-N-B) and the convexity of the skeletal profile (angle N-A-P). Pretreatment headfilms were used for this classification.

By means of serial roentgenographic cephalometry, the magnitude and direction of growth and the tooth movement both at the end of treatment and after the retention period were studied.

The relapse of the dental occlusion was determined by studying the pretreatment, end-of-treatment, and postretention headfilms and the corresponding models. The varying degree of relapse of the good and the poor facial pattern cases was noted. An attempt was made to evaluate the effect that growth had on the stability of the dental occlusion.

In some cases growth had a deleterious effect on the dental occlusion, resulting in an increase in the overjet. In the majority of cases, however, such variables as patient cooperation, correctness of treatment plan, habit, tooth size discrepancy, and thoroughness of the original treatment were the main factors responsible for the relapse.

1634 NORTH 197TH PL.
SEATTLE, WASH.

A Cephalometric Analysis of the Changes During Treatment of Various Types of Class II, Division 1 Cases: By Cecil B. Hall, D.D.S., M.S., University of North Carolina, Chapel Hill, North Carolina.

Seventeen patients with several types of Class II, Division 1 malocclusion were used in this study. Tracings were made of the before- and after-treatment cephalograms. The after-treatment tracing was superimposed on the before-treatment tracing in such a manner as to eliminate growth in the mandibular arch. The significant findings were as follows: (1) forward movement of the mandibular molar in most cases; (2) extrusion of molars and upper incisors in most cases; (3) distal movement of the upper first molar in nonextraction cases; (4) increased length of the facial plane in all cases; (5) no change in the gonial angle; (6) uprighting and lingual movement of the

maxillary incisor; (7) increase in the Y axis angle, indicating more vertical than horizontal facial growth; and (8) downward and some forward positioning of the chin.

304-306 First National Bank Bldg.
Hollywood, Florida

A Radiographic Method of Basilar Cephalometrics: By Donald H. Gilbert, Detroit, Michigan.

This study was undertaken to devise a method of producing standardized basilar view cephalograms. A Thurow cephalostat was modified by placing a vertically sliding orbital indicator on the inside of the left ear-rod holder.

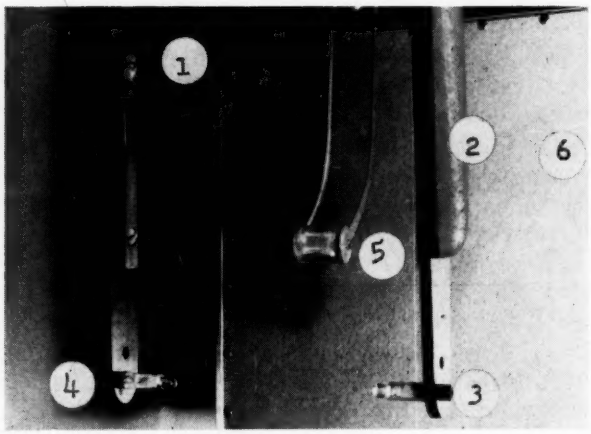

Fig. 1.—Modification of a Thurow cephalostat for positioning the subject for the basilar view cephalogram: *1*, Orbital indicator locates the anterior end of the Frankfort plane and serves to align that plane parallel to the film; *2*, ear-rod holder; *3*, right ear rod; *4*, left ear rod; *5*, nasion rest; *6*, cassette.

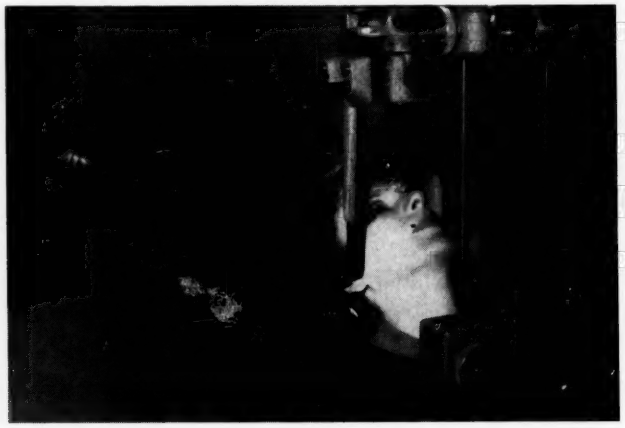

Fig. 2.—The subject in position for taking a basilar view cephalogram. The head is rotated back on the porionic axis until the Frankfort plane is vertical. The cassette has been removed and the orbital indicator is on the right side for purpose of illustration.

This provided a means of aligning the subject's head with the Frankfort plane vertical and parallel to the film. The subject was seated in a dental chair facing the film. The head was tipped back and the ear rods were inserted in

the external auditory canals. The orbital indicator was then brought to rest on a skin mark over left orbitale. Highly satisfactory superior-inferior views were produced at 120 kv. (140 KVP).

The radiographs showed sufficient detail for the location of many cephalometric landmarks and a number of new points which gave evidence of being of value in the measurement of basilar cephalograms.

The accuracy with which the method could be duplicated was tested. Duplicate films were made of each of fifteen subjects at separate sittings. Each pair of films was tested for accuracy of superimposition by comparing measurements of a series of length and width dimensions. A high degree of accuracy of superimposition of width factors was found, sufficient to warrant further use of the method in cephalometric studies. Significant errors in the superimposition of length factors were found.

The basilar cephalogram provides the third view in a cephalometric survey and reveals much valuable information. The dental arches are seen in relationship to each other and to the surrounding bony structures. Cranial base structures are clearly seen and traceable. The entire mandible is visible with an excellent view of the condyles. Skeletal asymmetries and the distortions associated with oral clefts are readily seen in the basilar view cephalogram.

17330 Livernois Ave.
Detroit, Mich.

Qualitative and Quantitative Analysis of Oral Muscle Pressures: By Isaac N. Abrams, University of Illinois, Chicago, Illinois.

The purpose of the study was the development of an instrument for the study of the muscles of the cheeks, lips, and tongue with respect to their anatomic variability, functional patterns, and influences on the position of the teeth.

Two methods were developed. One utilized an impression material, and the other used an electronic strain gauge. The impression method revealed the anatomic composition of the perioral muscle bands in the individual patient. An alginate impression material was injected into the vestibule. With the teeth clenched, the patient exerted pressure by tensing the lips and cheeks while keeping the configuration of the commissure fixed. An impression of the muscle bands was obtained, showing the course of individual muscles, their size, relative strength, and relation to the dentition. A preliminary survey demonstrated considerable variation in these aspects. There were sufficient indications of correlation between the organization of the musculature and malocclusion to warrant further intensive study.

Electronic pressure transducers were designed for the quantitative measurement of intraoral pressures. Miniature transducers of very high sensitivity were built, utilizing the SR-4 resistive wire strain gauge. They were designed to be placed anywhere in the mouth and to record pressures from many locations simultaneously. They were mounted in the laboratory on a thin vinyl plastic sheet adapted to the desired hard surface of the mouth and thus easily carried and held in the patient's mouth for recordings.

A survey of the activity of the musculature in swallowing and speech indicated the feasibility of measuring the position, rate, sequence, and intensity of function of the component segments of the muscle complex. For example, it was possible to compare the behavior and pressures of the tongue in swallowing foods of different consistency. One clinically normal case demonstrated a uniform swallowing pattern while the pressures increased with

food viscosity. While the tongue was active in introduction and swallowing, in this case, the lips were found completely passive during swallowing. With respect to speech, it was possible to study the contact areas of the tongue with the palate and teeth in rapid speech and to measure the pressures exerted at each area.

In addition to the study of functional behavior and the concomitant dynamic pressures, static pressures were examined. The instrument was applied to the examination of resting pressures of the tongue, cheeks, and lips arising solely from their weight and postural drape. An evaluation of these recordings indicated the presence of an artifact arising from the displacement of the tissues by the transducers. However, the fact that the resistance of the tissues to equal displacement was not uniform throughout the mouth suggested a different reaction of the tissues to a given orthodontic movement, depending on the location of the tooth in relation to the musculature and connective tissue.

In addition, static pressures arising from the maintenance of negative intraoral pressure showed considerable variation throughout the surface of the mouth. This inequality of pressures suggested that changes in the extent or intensity of the practice may well change the cumulative balance of pressures exerted on the denture.

350 Village Ln.
Los Gatos, Calif.

A Preliminary Study of Changes in the Lower Arch Subsequent to Cervical Force Treatment in the Maxillary Arch: By Douglas I. Bayne, D.D.S., Department of Orthodontics, Eastman Dental Dispensary, Rochester, New York.

This study was undertaken to evaluate changes in the mandibular arch while cervical force was confined to the maxillary arch. Thirty cases that presented a Class II molar relationship at the initiation of therapy were analyzed. Lateral cephalometric roentgenograms with the teeth in occlusion and study models were obtained at the beginning and termination of cervical traction treatment at which time all cases had a Class I molar relationship. The roentgenograms were traced and the two tracings were superimposed, using Broadbent's registration point. In addition, direct measurements were taken from the mandibular dental casts. These included the bicanine and bimolar widths.

Superimposition of the cephalometric tracings confirmed the results of previous studies. A preliminary analysis of the bicanine and bimolar dimensions in the lower arch resulted in interesting findings. There appeared to be a definite increase in mandibular bimolar dimensions ranging from 1.0 to 4.0 mm. The bicanine dimension in approximately one-half of the cases studied also was seen to have increased after the correction of molar relations.

A Roentgenographic Craniometric Evaluation of Several Bony Landmarks Used in Orthodontic Cephalometry: By Philip Greenstine, D.D.S., Eastman Dental Dispensary, Rochester, New York.

Correct usage of roentgenographic cephalometry as a diagnostic tool depends in part upon identifying critical bony landmarks. Certain landmarks were studied in order to test the accuracy of recognition.

The material consisted of the skulls of twenty-two adults and five children. Lateral headplates were taken of each skull, with and without wire

markers overlying important structures, and tracings of these were compared. An aluminum wedge was used to increase radiopacity of the anterior profile.

The most accurately traceable structures were basion and the anterior cranial fossa. The marked orbitale was usually 0.5 to 4.5 mm. anterior to unmarked orbitale, due to the difficulty of tracing the inferior orbital shadow anteriorly. Deviations in a vertical plane were slight. Errors in position of ANS varied up to 2 mm. and were attributed to the bifurcated form and/or radiolucency of the structure. Marked and unmarked points A and B varied between 0.5 and 4 mm. vertically and 0.5 and 2 mm. horizontally. This was probably caused by lack of congruency between true midline and somewhat laterally disposed alveolar outlines. True PNS was consistently 1 to 5 mm. posterior to the point usually chosen, probably because of its radiolucency and the masking effect of superimposed structures. Bolton point was invariably within 1 to 2 mm. of the internal surface of the occipital bone, rather than on or near the profile of the external surface.

The results suggest that thorough knowledge of skull anatomy and attention to exact definition will improve roentgenographic identification of certain landmarks, such as orbitale, ANS, and Bolton point; position of PNS along a horizontal plane can only be approximated; and other landmarks, such as points A and B, may present special problems of identification. In both cases, difficulties were increased because of ambiguity of definition. It is suggested that specific methods of construction should be formulated to supplement existing definitions.

A Comparative Cephalometric Analysis of Untreated Cleft Palate Adults and Normal Adults: By Jorge C. Mestre, D.D.S., Orthodontic Department, Eastman Dental Dispensary, Rochester, New York.

A comparative cephalometric analysis of untreated adults with cleft palate and normal adults was undertaken to determine whether there are significant skeletal differences between the groups. Twenty-nine subjects with unilateral clefts of the palate, twenty-eight subjects with posterior clefts of the palate, and thirty subjects without cleft palate were used as a part of this study. Both groups were composed of male and female adults of Puerto Rican ancestry, living on the island of Puerto Rico. This study was conducted in cooperation with the Division of Dental Public Health, United States Public Health Service.

A full series of cephalometric roentgenographs was obtained on each person, but only the lateral films were used for this study. Proportional linear and angular measurements were made and averages were obtained for purposes of comparison. The means obtained from linear measurements showed no differences between the cleft palate and control groups. A small and insignificant difference was found when the average angular measurements obtained for each respective group were compared.

The findings seem to indicate that (1) the anteroposterior and vertical dimensions of the maxilla and mandible are similar in the untreated adults with clefts of the palate and normal adults; (2) the maxilla and mandible are similarly positioned in relation to other parts of the cranial complex in both groups; (3) the untreated persons with cleft palate have matured to achieve relatively normal skeletal dimensions; and (4) the few cases of complete clefts involving the lip, alveolar process, and palate where only the lip was operated on at a late age appeared to have a comparatively normal maxillary arch contour.

The "Optic Plane," a Substitute for the Frankfort Horizontal in Roentgenographic Cephalometry: By Viken Sassouni, University of Pennsylvania, Philadelphia, Pennsylvania.

The Frankfort horizontal is a very important plane of orientation of the face. Its location by means of roentgenographic cephalometry has been found unreliable. This investigation was carried out in order to find a plane of similar orientation which can be located more accurately. After different tests, the optic plane was selected.

Definition: The optic plane is the bisectrix of the angle formed by the supraorbital plane (tangent to the anterior clinoid and the roof of the orbit) and the infraorbital plane (tangent to the floor of the orbit and the posterior contour of sella turcica). The optic plane reflects closely the path of the optic nerve toward the chiasma, and thus it is related to the natural orientation of the head. The optic apparatus seems to have a physiologic and phylogenic meaning.

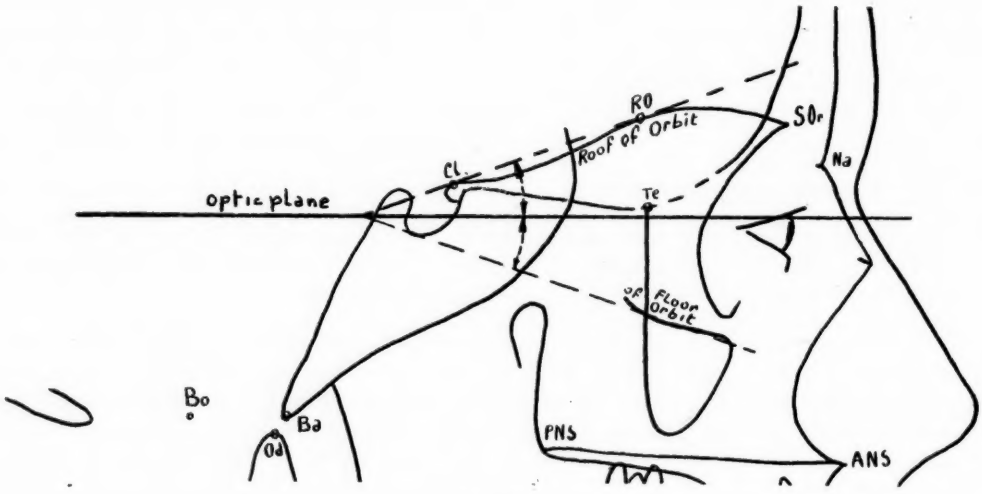

Fig. 1.

Relative position: The inclination of the optic plane (OP) was investigated in comparison to the Frankfort horizontal (FH), sella-nasion (S-Na), Bolton (Bo-Na), and palatal planes (Ans-Pns).

TABLE I. SAMPLE: THIRTY-ONE BOYS 12 TO 14 YEARS OF AGE WITH NORMAL OCCLUSION

	OP TO FH	OP TO S-NA	OP TO BO-NA	OP TO PALATAL PLANE
Mean	.63	7.52	22.84	3.91
Standard deviation	±2.33	±1.41	±3.16	±3.46
Range	−2 to +7	3 to 10	15 to 27	−3 to +12

Table I indicates the close relationship, in the averages, of the Frankfort horizontal and optic planes. It shows also a wide range of variation in individual cases among any of the planes. The lesser degree of variation of OP to S-Na is probably due to the use of sella turcica in both planes.

In conclusion, the optic plane, because of its greater accuracy, may be substituted for the Frankfort horizontal in the analysis of the dentofacial complex by means of roentgenographic cephalometry.

626 South 54th St.
Philadelphia, Pa.

News and Notes

A. A. O. Education Committee
Planning Conference for Orthodontic Education

A planning conference for orthodontic education, sponsored by the Education Committee of the American Association of Orthodontists, was held on Saturday, April 23, 1960, at the Shoreham Hotel in Washington, D. C.

Program

Welcome and Introduction of Participants and Guests. Edward J. Forrest, Chairman, Education Committee.

Introduction of Speakers (presiding: Boyd Tarpley, Professor and Head, Department of Orthodontics, University of Alabama; Member, Education Committee).

Objectives of Conference as Viewed by Council on Dental Education, American Dental Association. Shailer Peterson, Secretary, Council on Dental Education.

Objectives of Conference as Viewed by American Association of Dental Schools. Harry Lyons, Chairman, Committee on Advanced Education; Dean, University of Virginia School of Dentistry.

Historical Development and Future Philosophy of Orthodontic Education. Allan G. Brodie, Professor and Head, Department of Orthodontics, University of Illinois.

Luncheon.

Report of 1958 Orthodontic Workshop as Related to Education and Future Conferences. Robert Moyers, Professor and Head, Department of Orthodontics, University of Michigan; Member, Education Committee.

Areas and Problems of Orthodontic Education To Be Studied (Conference Discussion—Edward J. Forrest, Moderator).

Specific Recommendations for Second Conference on Orthodontic Education. (To be transmitted to A. A. O. for consideration.) Conference participants and Edward J. Forrest, Chairman, Education Committee.

Participants

Richard C. Beatty, Western Reserve University Dental School
William Biederman, New York University College of Dentistry
Victor Bowles, University of Kansas City School of Dentistry
William Brandhorst, Washington University School of Dentistry
Allan G. Brodie, University of Illinois College of Dentistry
Charles J. Burstone, Indiana University School of Dentistry
S. Eugene Coben, Temple University School of Dentistry
Melvin I. Cohen, Harvard School of Dental Medicine
Arthur Craven, University of Michigan School of Dentistry
John A. Crowley, Georgetown Dental School
Nicholas A. Di Salvo, Columbia University School of Dental and Oral Surgery
Fred Fabric, Washington University College of Dentistry
Edward J. Forrest, University of Illinois College of Dentistry
Jacob B. Franklin, Marquette University School of Dentistry
Clifford G. Glaser, University of Buffalo School of Dentistry
E. Harvold, University of Toronto Faculty of Dentistry

E. H. Hixon, State University of Iowa College of Dentistry
Joseph R. Jarabak, Loyola University School of Dentistry
Frank F. Lamons, Emory University School of Dentistry
Harry Lyons, American Association of Dental Schools
Ken Marshall, Saint Louis University School of Dentistry
J. Rodney Mathews, University of California School of Dentistry
R. G. Meisel, University of Pittsburgh School of Dentistry
Alton W. Moore, University of Washington School of Dentistry
Robert E. Moyers, University of Michigan School of Dentistry
Robert M. Nelson, University of North Carolina School of Dentistry
Shailer Peterson, Council on Dental Education, American Dental Association
Kyrle W. Preis, Baltimore College of Dental Surgery
Earl Shepard, Washington University College of Dentistry
Jerome H. Sklaroff, University of Pennsylvania School of Dentistry
Sherwood R. Steadman, University of Minnesota School of Dentistry
Boyd Tarpley, University of Alabama School of Dentistry
Robert E. Wade, Ohio State University School of Dentistry
Faustin N. Weber, University of Tennessee College of Dentistry
Samuel Weinstein, University of Nebraska College of Dentistry
A. P. Westfall, University of Texas Dental Branch

Northeastern Society of Orthodontists

The annual meeting of the Northeastern Society of Orthodontists was held at the Waldorf-Astoria Hotel in New York City on March 13, 14, and 15, 1960. A new record total of about 535 members and guests were registered for the meeting, which opened with a cocktail party on Sunday night.

The scientific sessions commenced at 9 A.M. Monday, when President Prezzano called the meeting to order, and continued through Tuesday afternoon. The essayists and their presentations were as follows:

Inadequacies of Mandibular Anchorage—Five Years Later. Stephen C. Hopkins.
Anchorage Considerations Involving Labio-Lingual Technique. E. C. Lunsford and H. K. Terry.
Different Types of Anchorage Used With the Twin Wire Mechanism. Joseph E. Johnson.
The Problem of Anchorage Control. K. C. Marshall.
Anchorage in Orthodontics. L. B. Higley.
Malfunctions of the Tongue—Its Causes, Effects, and Results in Regard to Orthodontic Treatment. Walter J. Straub.
Bone Crime Detection. Wilton M. Krogman.

There was also a panel discussion on anchorage by Drs. Higley, Hopkins, Johnson, Lunsford, Terry, and Marshall, with Dr. Walter Bedell acting as moderator.

Dr. Krogman concluded the scientific portion of the program with an interesting discussion of his role as "bone detective" in assisting law enforcement agencies in the identification of human remains during the past thirty years. He closed his remarks by quoting an old epitaph:

Here lies old Jones
Who all his life collected bones
Till Death, that grim specter,
That universal bone collector
Boned old Jones so neat and tidy.
Now here he lies all bona fide.

A testimonial luncheon on Monday was tendered Joseph D. Eby and Leuman M. Waugh to honor them as founders of the New York Society of Orthodontists, which subsequently became the Northeastern Society of Orthodontists.

The following slate of officers was elected:

President,	Henry C. Beebe
President-Elect,	Irving Grenadier
Vice-President,	William R. Joule
Secretary-Treasurer,	David Mossberg
Editor and Sectional Editor,	Joseph D. Eby
Assistant Editor,	Brainerd F. Swain
Historian,	Leuman M. Waugh
Board of Censors (for 3-year term),	Wilbur J. Prezzano

The Northeastern Society will hold its next meeting on Nov. 14 and 15, 1960, at the Hotel Statler-Hilton in Boston, Massachusetts.

Pacific Coast Society of Orthodontists

The twenty-sixth general meeting of the Pacific Coast Society of Orthodontists was held at Rickey's Studio Inn, Palo Alto, California, Feb. 21 to 24, 1960.

Attending were over 400 members, 175 ladies, and a number of orthodontists from other sections. Among the latter were George M. Anderson, William R. Humphries, and Dallas R. McCauley, president, president-elect, and vice-president, respectively, of the American Association of Orthodontists. Each of the A.A.O. officers spoke at the general luncheon. Dr. Anderson impressed the audience with his description of both the internal and the external problems of the orthodontic specialty and what is being done about them.

President Richard M. Railsback opened the meeting on Monday morning with a fine address in which he told the membership of the many accomplishments that had taken place during the last two years and described some of the problems. He was high in his praise of the Program Committee, led by Chairman Eugene E. West and made up of chairmen of the various sections—J. Rodney Mathews, John H. Sibley, Rodney E. Johnson, Norman S. Snyder, Arthur F. Skaife, Glen W. Foor, Ray A. Lussier, Seymour Gray, and Arnold W. Wieser. President Railsback paid special tribute to the fine work and cooperation of the secretary and treasurer, Warren A. Kitchen.

The meeting was enthusiastically hailed by the membership as the best of the twenty-six general meetings, and the Committee also received the grateful thanks of the membership. A brief résumé of the program follows.

Monday, February 22

Call to Order.

Invocation. Rev. Joseph D. Munier, St. Patrick's Seminary, Menlo Park, California.

President's Address. Richard M. Railsback.

Business Meeting.

Scientific Program

(Denton J. Rees, Presiding Chairman)

Why the Increasing Interests in Congenital Malformations? Samuel Pruzansky, Skokie, Illinois.

How Legislation Affects Dentistry. Ben H. Read, Los Angeles, California.

Treatment Timing, Growth, and Improvement Potential for Class II Malocclusions. Elbert W. King, Albuquerque, New Mexico.

Case Analysis and Treatment Planning in the Permanent Dentition. Robert D. Payne, Phoenix, Arizona.

Tuesday, February 23

(John H. Parker, Presiding Chairman)

Dilemma in Mixed Dentition Treatment. Wendell L. Wylie, San Francisco, California.

Surgical Correction of Mandibular Prognathism. Marsh Robinson, Santa Monica, California.

Condensed Reports:

Use and Abuse in Headgear Therapy. Kenneth Kahn, Seattle, Washington.

Case Report—Class III Surgical Correction. Thomas E. Lewis, San Jose, California.

Round-Table Luncheon. Topic: "Arch Length Discrepancies." (This informal discussion allowed for an exchange of ideas on a subject which is basic in our case analysis and treatment planning. A leader at each table served as moderator for the group.)

WEDNESDAY, FEBRUARY 24

(Robert A. Lee, Presiding Chairman)

Parental and Pedodontic Attitudes Toward Orthodontics. Carl Ellerston, Jr., Palo Alto, California.

Orthodontic Diagnosis and Treatment of Congenital and Acquired Facial Malformations. Samuel Pruzansky, Skokie, Illinois.

Condensed Reports:

A Method of Transferring Student Patients. John Rathbone, Santa Barbara, California.

Indirect Band Formation. Ivan F. Lee, La Jolla, California.

Board of Directors Meeting.

Limited-Attendance Clinics.

1. "Case Analysis and Treatment Planning." Robert Payne.
2. "Cephalometrics for Treatment Planning and Analysis." Cecil Steiner.
3. "Clinical Value of Special Cephalometric Projection" (Oriented Oblique Film—Phonation—Inflation). Samuel Pruzansky.
4. "Malfunction of the Tongue." Walter Straub.
5. "Light Force—The Thinking Man's Therapy." Arnold Stoller.
6. "The Influence of Headgear Design on Tooth Movement." Donald Poulton.
7. "Speech Problems in Relation to Orthodontics." Lucie Lawson, Ph.D.
8. "A Technic for Treatment Timing and Treatment Planning in Class II Malocclusions." Elbert King.
9. "Surgical Correction of Micrognathism." Marsh Robinson.
10. "The Surgical Orthodontic Team Approach to the Prognathism Problem." Marsh Robinson and Joseph Schurter.

Cocktail Party and President's Banquet.

Entertainment.

An outstanding feature of the meeting was the display of the work completed to date by the seven men going through preceptorship. The membership spent all day Saturday questioning the junior associates and examining records of the work accomplished by each at the end of the first year. This was found highly satisfactory.

The officers for the next two years are as follows: *President,* E. Allen Bishop; *President-Elect,* Herbert V. Muchnic; *Vice-President,* Murray L. Ballard; *Secretary and Treasurer,* Warren A. Kitchen; and *Director to the American Association of Orthodontists,* William S. Smith.

The next meeting will be held in Seattle, Washington, in August, 1961.

William S. Smith, Editor

Southern Society of Orthodontists

The Southern Society of Orthodontists will hold its thirty-ninth annual meeting at the Grand Hotel in Point Clear, Alabama, June 26 to 30, 1960.

American Dental Association

DR. ALSTADT HEADS BOARD OF HEALTH*

Dr. William R. Alstadt, Little Rock, has been elected president of the Arkansas Board of Health. Dr. Alstadt [an orthodontist], a past president of the Association, has been on the board about a year and a half.

DR. JESERICH AGAIN BACKS FLUORIDATION*

A statement by Pres. Paul H. Jeserich supporting fluoridation appeared in Jan. 31 issue of *RWDSU Record,* publication of the AFL-CIO affiliated Retail, Wholesale and Department Store Union. A spokesman for the 160,000-member union said the group "has, along with the AFL-CIO, belief in fluoridation and would like to further the nationwide effort to bring more cities under this program." In his statement, Dr. Jeserich said:

> I can see no valid reason which should prevent any city from adopting fluoridation of its water supply—a health measure which repeatedly has been proved safe, effective and economical.

BRIEFS IN THE NEWS*

Dr. Charles H. Patton, Philadelphia, president-elect, has been appointed an honorary dental consultant to surgeon general of the Navy. . . . Feb. 4-6 marked third anniversary of the formal completion of the expansion and remodeling of Central Office headquarters. . . . Dr. Gerald D. Timmons, Philadelphia, speaker of the House of Delegates, received the Honor Award of Rhode Island State Dental Society at ceremonies Jan. 16 in Providence. Dr. Timmons is recovering from recent surgery.

NAME FOUR NEW OFFICIALS IN CENTRAL OFFICE ORGANIZATION CHANGES†

Several changes have been announced by Secretary Harold Hillenbrand in organization and personnel of the Central Office staff. The changes, effective April 1, include the naming of four new assistant secretaries. The changes:

Dr. C. Gordon Watson, San Diego, California, has been appointed assistant secretary: Administrative Affairs.

Bernard J. Conway has been appointed assistant secretary: Legal Affairs. Conway will continue as secretary of the Judicial Council. However, he will be succeeded as secretary of the Council on Legislation by Hal M. Christensen, formerly assistant secretary of the council. Christensen will continue as assistant secretary of the Judicial Council.

Dr. J. Roy Doty has been appointed assistant secretary: Research and Therapeutics. Dr. Doty will continue as secretary of the Council on Dental Therapeutics.

Dr. Shailer Peterson has been appointed assistant secretary: Educational Affairs. Dr. Peterson will continue as secretary of the Council on Dental Education.

Dr. C. Willard Camalier will continue in his present position as assistant secretary: Washington Office.

Miss Doris Nugent was appointed assistant to the secretary of the Association. A new method of organizing the Central Office staff has been under study for two years by Secretary Hillenbrand in consultation with a special committee of the Board of Trustees.

FATE OF FORAND BILL THIS SESSION IS STILL UNCERTAIN—ADA STATES OPPOSITION TO CONTROVERSIAL MEASURE†

The Forand bill which still is bottled up in a House committee continues to be one of the most controversial pieces of social legislation on the Washington scene. The Eisenhower

*From the *ADA News Letter,* Feb. 15, 1960.
†From the *ADA News Letter,* April 1, 1960.

administration had decided, as Secretary Arthur S. Flemming of Health, Education and Welfare, said, to "oppose any program of compulsory health insurance." Rep. Aime J. Forand (D., R. I.) has strong labor backing for his bill to provide medical and hospital care for persons eligible to receive social security benefits. Forand estimates his program would cost the nation $1,120,000,000 the first year. Republican members of the House Ways and Means Committee considering the bill place the cost at $2 billion the first year and $6 to $7.5 billion a year thereafter.

ADA spokesmen met with HEW officials earlier this month to express the Association's opposition to the so-called Forand type of legislation. The Association also has requested an opportunity to testify before the Senate committee that is planning to begin hearings soon on similar legislation. The American Medical Association and the AFL-CIO's committee on political education (C.O.P.E.) are engaged in a running argument over the Forand bill that is being reported extensively by news media. AMA has demanded the AFL-CIO retract a series of allegedly "scurrilous" charges contained in a political memorandum released by the C.O.P.E. committee Feb. 1. The union had charged the AMA traditionally has opposed many health measures that were for the good of the public. In Congress, Republican leaders feel that a great deal more information is needed before any program of medical care for the aged should be enacted. They believe it would be desirable to hold off such legislation until the White House Conference on Aging is held in Washington, D. C., next Jan. 9-12. Meanwhile, Forand is attempting to force his bill out of the Ways and Means Committee and onto the House floor in the event the committee votes against it. To do this, he must line up sufficient support for a discharge petition. Labor spokesmen indicate that, so far, they do not have sufficient votes to do this. Signatures of 219 House members are needed to discharge the bill.

TAX RELIEF FOR SELF-EMPLOYED MAY BE NEAR*

Reliable reports from Washington indicate self-employed persons may in the not too distant future be able to defer income taxes on limited amounts set aside for retirement purposes. It is reported the Treasury Department plans to send Congress a modified version of the Smathers-Morton-Keogh-Simpson bill, H.R. 10, which seeks to establish this principle. The bill, which has passed the House, now is awaiting action by the Senate Finance Committee. Action by the committee is expected as soon as the Treasury proposal has been received and appraised. ADA is among the organizations of the self-employed that have been seeking such legislation. The Council on Legislation feels some version of the bill has an excellent chance for enactment this session of Congress.

COMMITTEE ASKS $12,594,000 FOR DENTAL HEALTH*

The House Appropriations Committee has recommended that the federal government spend $12,594,000 on dental health activities during the next fiscal year. This would be an increase of $1,390,000 above the sum recommended by the President's budget for 1961 and $2,575,000 above the amount provided for fiscal 1960. The House committee's recommendation, however, is $3,835,000 below the $16,429,000 requested by the Association for next year. The committee's recommendation provides the following increases over the 1960 totals: $970,000 more for research projects, $209,000 more for training, and $1,396,000 more for direct operations. Most of the increase for direct operations would go to equip the research building under construction at Bethesda, Md., for National Institute of Dental Research.

ADA EXPECTS FEHBA TO COVER CERTAIN DENTAL CARE†

Association spokesmen have been assured certain dental benefits will be covered under the Federal Employees' Health Benefit Act (FEHBA). The assurances come as a result of conferences held by the Council on Legislation with Civil Service Commission officials and congressmen and by the Council on Dental Health with Blue Cross-Blue Shield and the insurance industry. FEHBA will cover about 1.8 million employees and their estimated 2 million dependents. Employees will have their choice of Blue Cross-Blue Shield service coverage or indemnity protection from the insurance industry. Dental benefits probably will

*From the *ADA News Letter*, April 1, 1960.
†From the *ADA News Letter*, March 15, 1960.

be limited to repair of accidental injuries to teeth and certain acute medical and surgical conditions of the oral tissue whether performed by licensed dentists or physicians. The ADA initially entered the picture when it became apparent the proposed FEHBA regulations might (1) permit the arbitrary denial of certain essential health benefits to beneficiaries and (2) discriminate unnecessarily against licensed dentists. Final regulations are expected from Civil Service within two weeks. Aetna Life Insurance Company has been designated as prime carrier of the government-wide indemnity benefit plan for the insurance industry.

American Association of Dental Schools

The American Association of Dental Schools held its thirty-seventh annual session in Chicago, Illinois, March 20 to 23, 1960, with more than 750 persons in attendance. Dean Robert W. McNulty, president of the Association, presided at the meeting. Dean Raymond J. Nagle, New York University College of Dentistry, was installed as president for 1960-1961; Dean Lester W. Burket, University of Pennsylvania School of Dentistry, was chosen president-elect; and Dean George W. Teuscher, Northwestern University Dental School, was named vice-president. Dean Paul H. Jeserich, University of Michigan School of Dentistry, was elected to membership on the Executive Council of the Association, term expiring in 1964.

Indiana State Society of Orthodontists

On Sunday, May 17, 1959, twenty-nine orthodontists met in Indianapolis to form the Indiana State Society of Orthodontists. Among the purposes of the organization are the following:

1. To act as spokesman for Indiana orthodontists in the areas of publicity and public relations, legislative matters, and cleft palate rehabilitation and to assist other fields of dentistry in any way possible.
2. To promote acquaintance and understanding among the orthodontists of the state.
3. To hold meetings to conduct business of the Society.
4. To promote cooperation among orthodontists.
5. To act in an advisory capacity to state and local dental societies on matters pertaining to orthodontics.

Second Annual Margolis Lecture and Meeting

The second annual Margolis Lecture and Meeting, sponsored by the faculty and alumni of the Department of Orthodontics of Tufts University School of Dental Medicine, will be held June 17, 18, and 19, 1960, at the Lake Tarleton Club in Pike, New Hampshire. The theme of the meeting will be clinical orthodontics.

Participants will be the following:

BASIL G. BIBBY, B.D.S., D.M.D., Ph.D., Rochester, New York, Director of the Eastman Dental Infirmary and formerly Dean of Tufts University School of Dental Medicine. Dr. Bibby will deliver the second Margolis Lecture on Friday, June 17, at 8 P.M. (subject to be announced).

P. RAYMOND BEGG, D.D.Sc., L.D.S., B.D.Sc., Adelaide, Australia, Lecturer in Orthodontics, University of Adelaide. Dr. Begg's presentations will include a description of his use of light wire forces in the treatment of malocclusion and a demonstration of seventy treated cases.

T. M. GRABER, D.D.S., M.S.D., Ph.D., Chicago, Illinois, formerly Associate Professor, Northwestern University, and Director of Cleft Lip and Palate Institute. Dr. Graber will discuss applied clinical cephalometrics with particular emphasis on preliminary assessment, results of clinical achievement, and cephalographic records subsequent to retention.

PAUL D. LEWIS, D.M.D., Seattle, Washington, Clinical Associate, Department of Orthodontics, University of Washington. Dr. Lewis will discuss the edgewise arch mechanism as it is used in the Northwest Pacific area by students at the University of Washington, by his colleagues, and in his own practice.

HERBERT I. MARGOLIS, D.M.D., L.H.D., Boston, Massachusetts, Professor and Head of Department of Orthodontics, Tufts University. Dr. Margolis will lecture on "Harnessing Growth in Clinical Orthodontics."

There also will be a program planned for the ladies.

All pertinent information will be mailed to members of the American Association of Orthodontists.

Columbia University Orthodontic Alumni

Columbia University orthodontic alumni all over the world who are not receiving society notices or who have recently moved are requested to send their present addresses to the secretary of the Society:

Dr. Francis J. Loughlin
8559 168th St.
Jamaica 32, New York.

Denver Summer Meeting

The program has been completed for the twenty-third annual Denver Summer Meeting for the Advancement of Orthodontic Practice and Research, which will be held at Writer's Manor in Denver, Colorado, July 31 to Aug. 5, 1960. The following participants will present papers:

Harold S. Born, D.D.S.

Topic of discussion: "Aids in Case Presentation."

A means of better educating your patients in order that they may assume more of their rightful responsibilities, thus making the practice of orthodontics more pleasant and efficient for both you and your patients.

Joseph R. Jarabak, D.D.S., M.S., Ph.D.

Topic of discussion: "The Biomechanical Aspects of Light and Light Differential Forces in the Treatment of Malocclusions."

Subtitles:

1. Biologic and Physiologic Considerations of Light Wire Forces (Optimum Forces) in Orthodontics.
2. Theoretical Mechanics Applied to the Use and Control of Light Forces From Highly Resilient Wires.
3. Treatment Planning and Clinical Procedures in the Treatment of (1) Nonextraction Malocclusions and (2) Malocclusions Requiring the Extraction of Teeth.
4. Sequence in the Treatment Chronology of Nonextraction and Extraction Malocclusions. (A simultaneous panoramic showing of the original malocclusion, the intervening treatment steps and the progress between each step, and finally the finished case. The treatment history and the finished result unfold before the viewer's eyes at one time through the medium of panoramic projection.)

James Jay, D.D.S.

Title: "Total Extra-Oral Therapy."

Topics of discussion:

1. An Anatomical and Etiological Basis for Orthodontic Procedure.
2. A Diagnostic Test of Orthodontic Therapy.

3. The "Harnessing" of Growth in Treatment Planning.
4. Total Extraoral Appliance Technique.
5. Extraoral Therapy as a Complete Approach to Orthodontic Treatment, Rather Than as an Aid to Other Therapies.

Phillip H. Starr, M.D.

Topics of discussion:

1. Introduction—The Psychiatric Approach; Its Basis and Rationale.
2. The Psychological Aspects of Orthodontic Practice.
3. The Psychological Aspects of Thumb-Sucking as it Relates to Dental Malocclusion.

Entertainment has not been neglected. This consists of the annual supper on the evening of July 31 for all in attendance. Members of the twenty-third annual meeting and their families will enjoy famous old Central City and dinner at the historic Teller House, followed by a play in the Opera House, on Tuesday evening.

Hotel reservations should be made directly with Miss Kilgore, Writer's Manor, 1730 South Colorado Blvd., Denver, Colorado. Mention that you are with the Denver Summer Meeting, as a block of rooms have been reserved for our group. It is the opinion of the Board of Trustees that Writer's Manor will afford the finest of accommodations, as it has in the past. It has a variety of eating places, excellent food, air-conditioning, a swimming pool, and a minimum of noise.

A printed program will be mailed at a later date to those who send in applications indicating attendance. A fee of $105.00 is requested with your application. If application is accepted, the deposit will not be refunded but will cover the cost of a transcript of the meeting, which will be mailed to the applicant.

Attendance is limited, and applications will be given preference in the order of their return.

Notice of Annual Meeting of Members

The annual meeting of members of the Association for the Denver Summer Meeting for the Advancement of Orthodontic Practice and Research will be held in the lecture hall, Writer's Manor, Denver, Colorado, on August 5 at 11:30 A.M. for the following purposes:

(1) Election of certain trustees in accordance with the By-Laws.
(2) Ratification of acts of the Board of Trustees and officers since the last annual meeting.
(3) Transaction of any other business that may properly come before the meeting.

Eli H. Mullinax, Secretary

Pennsylvania Dental Association

The ninety-second annual session of the Pennsylvania Dental Association is scheduled for May 12 to 14, 1960, in the Penn Harris Hotel, Harrisburg, Pennsylvania, with President Earl H. Albert presiding. The program will include essays, table clinics, a panel discussion, scientific films, and a president's dinner.

Dr. Charles H. Patton, president-elect of the American Dental Association, will highlight the opening meeting on Thursday morning with an address to a general assembly on "The Challenges of the Next Century."

Loyola University

Loyola University School of Dentistry announces that an extension course in "Fundamentals of Light Wire Forces in Treatment" will be given May 22 to 31, 1960, at 5601 River Rd., Washington, D. C. The course will be under the direction of Dr. Joseph R. Jarabak, Professor and Chairman of Orthodontics, Loyola University School of Dentistry, Chicago, Illinois.

Flying Dentists

There will be an organizational meeting of the Flying Dentists on June 5, 1960, in Amarillo, Texas. Those interested should contact Dr. Bill Stevenson, Jr., 610 West 8th St., Amarillo, Texas, or write direct to Farrell Manor, Box 81, Amarillo, for reservations. Fly-in will be Saturday, June 4, at Tradewind Airport; transportation will be available. The constitution and by-laws and the official name of the group will be adopted at this organizational meeting.

Dr. Weinberger Recovering From Illness

Bernard W. Weinberger, orthodontist and authority on the history of dentistry, is reported to be recovering nicely from a recent illness.

Dr. Weinberger is now retired and lives at Claiborne Towers, Canal Street, New Orleans, Louisiana.

Notes of Interest

Michael E. Fleming, D.D.S., announces the removal of his office to 38 First St., Troy, New York, practice limited to orthodontics.

Saul N. Greenberg, D.D.S., announces the new location of his office at 143-33 Sanford Ave., Flushing, New York, practice limited to orthodontics.

Morton Haber, D.D.S., announces the opening of his office at 262 Woodcrest Rd., Paramus, New Jersey, practice limited to orthodontics.

William M. Jarrett, D.D.S., and Charles H. Hopkins, D.D.S., announce the removal of their offices to 201 Nelson Bldg., Charleston, West Virginia, practice limited to orthodontics.

Kleve C. Johnson, D.M.D., M.S., announces the opening of his office at 295 Miller Ave., Mill Valley, California, practice limited to orthodontics.

Arnold J. Labbe, D.D.S., and Joseph Jacobs, D.D.S., announce their association for the practice of orthodontics, 607 South Capitol Ave., Lansing, Michigan.

I. E. Sanderson, D.D.S., M.S., announces the opening of his office in the Lowry Medical Arts Building, St. Paul, Minnesota, practice limited to orthodontics.

Forthcoming meetings of the American Association of Orthodontists:
1961—Denver Hilton Hotel, Denver, Colorado, April 16 to 21.
1962—Statler Hotel, Los Angeles, California, April 28 to May 3.
1963—Americana Hotel, Miami Beach, Florida, April 28 to May 2.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and its component societies. The Editorial Board of the JOURNAL is composed of a representative of each of the component societies.

American Association of Orthodontists
(Next meeting April 16-21, 1961, Denver)

President, George M. Anderson - - - - - - - - - - - - 3700 N. Charles St., Baltimore Md.
President-Elect, William R. Humphrey - - - - - - - - - - - - Republic Bldg., Denver, Colo.
Vice-President, Frank A. Heimlich - - - - - - - - 1824 State St., Santa Barbara, Calif.
Secretary, Earl E. Shepard - - - - - - - - - - - 225 South Meramec, Clayton, Mo.

Central Section of the American Association of Orthodontists
(Next meeting Sept. 18-20, 1960, St. Louis)

President, Leo B. Lundergan - - - - - - - - - - 8000 Bonhomme Ave., St. Louis, Mo.
Secretary-Treasurer, Kenneth E. Holland - - - - - - - 1019 Sharp Bldg., Lincoln, Neb.
Director, Elmer F. Bay - - - - - - - - - - 216 Medical Arts Bldg., Omaha, Neb.

Great Lakes Society of Orthodontists
(Next meeting Nov. 27-30, 1960, Cincinnati)

President, Hunter I. Miller - - - - - - - - - - - 1416 Mott Foundation Bldg., Flint, Mich.
Secretary, Edward A. Cheney - - - - - - - - - - - 1201 Bank of Lansing Bldg., Lansing, Mich.
Director, Harlow L. Shehan - - - - - - - 601 Jackson City Bank Bldg., Jackson, Mich.

Middle Atlantic Society of Orthodontists

President, Kyrle W. Preis - - - - - - - - - - - 700 Cathedral St., Baltimore, Md.
Secretary-Treasurer, Charles S. Jonas - - - - - - Mayfair Apts., Atlantic City, N. J.
Director, Louis E. Yerkes - - - - - - - - - - - - 825 Linden Ave., Allentown, Pa.

Northeastern Society of Orthodontists
(Next meeting Nov. 14 and 15, 1960, Boston)

President, Henry C. Beebe - - - - - - - - - - - Medical Centre, White Plains, N. Y.
Secretary-Treasurer, David Mossberg - - - - - - 36 Central Park S., New York, N. Y.
Director, Norman L. Hillyer - - - - - - - 230 Hilton Ave., Hempstead, L. I., N. Y.

Pacific Coast Society of Orthodontists
(Next meeting Aug. 6-10, 1961, Seattle)

President, E. Allen Bishop - - - - - - - - - - - 703 Cobb Bldg., Seattle, Wash.
Secretary-Treasurer, Warren A. Kitchen - - - - - 2037 Irving St., San Francisco, Calif.
Director, William S. Smith - - - - - - - - - - - 2530 Bissell Ave., Richmond, Calif.

Rocky Mountain Society of Orthodontists
(Next meeting Sept. 25-28, 1960, Santa Fe)

President, William A. Blueher - - - - - - - - - 801 Encino Pl., Albuquerque, N. M.
Secretary-Treasurer, E. H. Mullinax - - - - - - - 8790 W. Colfax, Lakewood, Colo.
Director, Ernest T. Klein - - - - - - - - - - - 707 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists
(Next meeting June 26-30, 1960, Point Clear, Ala.)

President, M. D. Edwards - - - - - - - - - - - - - - - 132 Adams St., Montgomery, Ala.
Secretary-Treasurer, William H. Oliver - - - - - - - 1915 Broadway, Nashville, Tenn.
Director, Boyd W. Tarpley - - - - - - - 2118 Fourteenth Ave., S., Birmingham, Ala.

Southwestern Society of Orthodontists
(Next meeting Sept. 25-28, 1960, Kansas City, Kan.)

President, John W. Richmond - - - - - - - 493 Brotherhood Bldg., Kansas City, Kan.
Secretary-Treasurer, Tom M. Matthews - - - - - - 8215 Westchester Dr., Dallas, Texas
Director, Nathan Gaston - - - - - - - - - - - - 701 Walnut St., Monroe, La.

American Board of Orthodontics

President, L. Bodine Higley - - - - University of North Carolina, Chapel Hill, N. C.
Vice-President, Jacob A. Salzmann - - - - - - - 654 Madison Ave., New York, N. Y.
Secretary, Wendell L. Wylie - - - - - - University of California School of Dentistry, The Medical Center, San Francisco, Calif.
Treasurer, Paul V. Reid - - - - - - - - 1501 Medical Arts Bldg., Philadelphia, Pa.
Director, B. F. Dewel - - - - - - - - - - - - - - 708 Church St., Evanston, Ill.
Director, Frank P. Bowyer - - - - - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.
Director, Alton W. Moore - University of Washington School of Dentistry, Seattle, Wash.